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Dr Tumelo Tlhoiwe
VICE CHANCELLOR

Vice Chancellor's Message To DDT academics Family and the Nation at large During this COVID-19 Pandemic

The whole world has been affected by Coronavirus, economies have shrunk, loved ones lost but our good lord has sustained us. I encourage everyone to consider research as a priority in order to come up with solutions to fight this pandemic.

The struggle you are in today is developing the strength you need for tomorrow. Being challenged in life is inevitable, but you have the choice to decide how you will react to the situation. Especially now, in this time of covid-19 crisis and uncertainty, change the changeable and accept the unchangeable. We may not be able to see it in the moment, but everything happens for a reason. Use this time to make a difference in your life or in the lives of someone else. Work on all areas of personal growth, spend quality time with family, and focus on goals for the future.

Train yourself to find a blessing in everything, Someone once said these words to me, which have stayed in my mind throughout my life. I truly believe that we are not put into a situation that we cannot conquer. Seeing the light in the midst of darkness is a lesson we all should learn, not only during this difficult time, but all the time. Stay focused on the good and making it better. It can only go up from here.

It's tough to see the light in times of darkness. My advice for all researchers and students is to continue to be positive and never give up hope. It's when we start to lose hope that we begin to struggle mentally. Lend a listening ear to everyone; sometimes all someone needs is a person willing to listen. We all need to come together in this time and continue to check on loved ones, friends, teammates, roommates, and classmates. You never know the impact of what a simple 5 minute phone call could do for someone. Spread that love each and every day.

"Life throws you curves but you learn to swerve." No one is ever really prepared for God's greater plans, but we figure it out, taking it one day at a time. During my time at university, there were some unfortunate events, but we always came together as a community to get it through it as one. Now more than ever, we need to take care of each other. Luckily we live in a world we can talk with friends and family virtually. Take care of yourself and your loved ones. We'll all look back on this time and remember the ones who helped us through this challenging time.

"Nothing in life is to be feared, it is only to be understood. Now is the time to understand more, so that we may fear less."

"A life lived in fear is a life half lived."

VC

Dr Derrick D. Tlhoiwe
CHANCELLOR

Chancellor's Message

To all academic fraternity of DDT College of medicine and beyond, I would like to thank every one of you for your contribution in building Our University college. Thank you for believing in our vision.

DDT continues with its vision as the top medical university in Botswana and draws inspiration from the government of Botswana which has encouraged every citizen to migrate from a minerals-led to a knowledge-based economy, DDT aspires to bring knowledge to Batswana by engaging in state of the art research work and bring solutions to challenging health problems such as the covid-19 pandemic.

Yes our journey has not been smooth, we all understand, "The size of your success is measured by the strength of your desire; the size of your dream; and how you handle disappointment along the way." Disappointments are just God's way to saying 'I've got something better'. Be patient, live life, have faith." We shall overcome every barrier ahead of us for ours is a noble task of improving the lives of Batswana.

I encourage everyone of you to commit to research work, Desire to face the challenge in solving the unsolved problems, concern over practical problems initiates research; Desire to get intellectual joy of doing some creative work; Desire to be of service to society; Desire to get respectability due to your creativity and innovation.

Covid-19 has ravaged many economies, I therefore encourage everyone of you to dedicate considerable amount of time in coming up with solutions to curb this pandemic.

DDT will set aside substantial amount of resources to go into each faculty research work. Your commitment to research will also build your promotion ladder to senior lecturer, assistant professor to full professor.

Last but not the least, I encourage you once again to remember that, The road to success and the road to failure are almost exactly the same it depends on the one you want embrace, Success is not final; failure is not fatal: Opportunities don't happen. You create them , It is the courage to continue that counts. It is better to fail in originality than to succeed in imitation. There are two types of people who will tell you that you cannot make a difference in this world: those who are afraid to try and those who are afraid you will succeed.

Chancellor

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ANALYSIS OF COVID-19 FIRST GENERATION VACCINES DESIGN VIRAL PLATFORMS USED.

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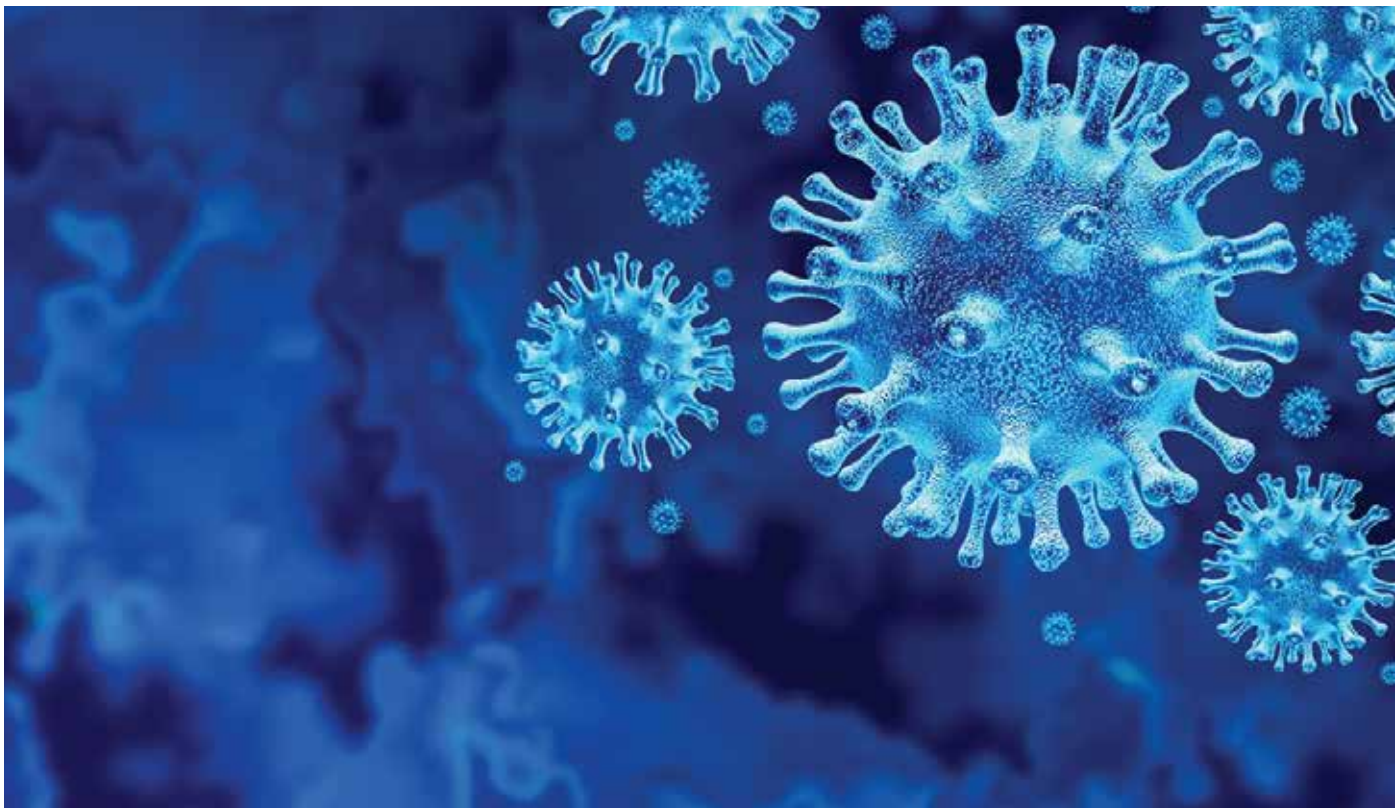


Abstract:

Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) or Coronavirus was initially detected in Wuhan, China in December 2019 and has subsequently resulted in the COVID-19 pandemic. The disease presents asymptomatically in some of individuals yet also causes symptoms ranging from those associated with influenza and pneumonia, acute respiratory distress syndrome (ARDS) and even death. The world is currently relying on physical (social) distancing, hygiene and repurposed medicines; however, it is predicted that an effective vaccine will be necessary to ensure comprehensive protection against COVID-19. There has been a global effort to develop an effective vaccine against SARS-CoV-2 with approximately 300 vaccines in clinical trials, and over 200 more in different stages of development. This review provides insight in respect of vaccines, which are in clinical use as of December 2020 and focusses on the Pfizer/ BioN-Tech/Fosun, Moderna mRNA-1273 and AstraZeneca/Oxford AZD1222 vaccines.

Keywords: Coronavirus; Vaccines; AstraZeneca; Moderna (mRNA-1273); Pfizer, Johnson and Johnson, Gamaleya, Sinopharm, Viral Vector, Sputnik.

1.Introduction

In December 2019 a Coronavirus (COVID-19) outbreak was identified in Wuhan, China which subsequently spread across the globe. The COVID-19 pandemic has been attributed to the acute respiratory syndrome coronavirus-2 (SARS-CoV-2) and exhibits a range of the clinical symptoms some of which are similar to influenza, include acute respiratory distress syndrome (ARDS) and pneumonia in addition to presenting with asymptomatic patients and all may ultimately result in mortality [1]. Initially the pandemic was perceived to be simple to manage with interventions such as physical (social) distancing, use of masks, adequate use of other personal protective approaches including hand sanitizer and face mask use however, at the same time and it was anticipated that the use of existing and new antiviral drugs, and effective vaccines would reduce mortality rates of COVID-19. Perhaps the initial naïve perception that the development of herd immunity through natural development of immunity through infection was the contributor to significant loss of life due to death [1]. By way of example, in Sweden, the authorities presumed that if 60% of the total population had been infected the resultant herd immunity would be adequate to

The comparison of number of infections eliminated by use of the vaccine in the other group was carried out by analysing the difference between r2 and r1 and in this case, it was established that the AstraZeneca vaccine was 73% effective and facilitates removal of 73% of cases which would otherwise occur.

protect the population [1,2].

However, this presumption failed, and a significant number of the Swedish population have since lost their lives due to COVID infection [2]. Consequently, the development of an efficient vaccine has been perceived as the only practical way to ultimately establish herd immunity on the globe. Researchers across the globe have been developing a vaccine for COVID-19 resulting in many vaccine candidates e in different stages of development of which some are in Phase 1 clinical trials [3].

The development of a safe and effective vaccine requires pre-clinical and clinical trials be conducted to minimize the potential of severe adverse effects when used on a large scale [3]. This review will focus on the current vaccines in which a summary of the biological and immune responses observed from previous COVID-19 infections and SARSCoV-2 is provided. In addition, this review describes exploratory and pre-clinical stages of SARS-CoV-2 vaccine development and a discussion regarding the target platform for designing an effective and safe COVID-19 vaccine with relevant clinical trial data. Furthermore, the ethical concerns surrounding the development and production of these vaccines is considered.

2. Immunogenicity to SARS-CoV-2

Recovery following SARS-CoV-2 infection requires a strong immune response and individuals infected with COVID-19 exhibit a strong immune response to the virus which also facilitates their convalescence [4,5]. Current evidence suggests that helper T cells in COVID-19 infected individuals recognise e spike proteins on the SARS-CoV-2 viral architecture. Consequently, T cells play a significant role in elimination of SARS-CoV-2 from the human body [5]. Moreover, the structure of SARS-CoV-2 includes a major trimeric glycoprotein envelope or S-protein located on the surface of the virus facilitating binding to host cells making it a primary target for the development of a successful vaccine.

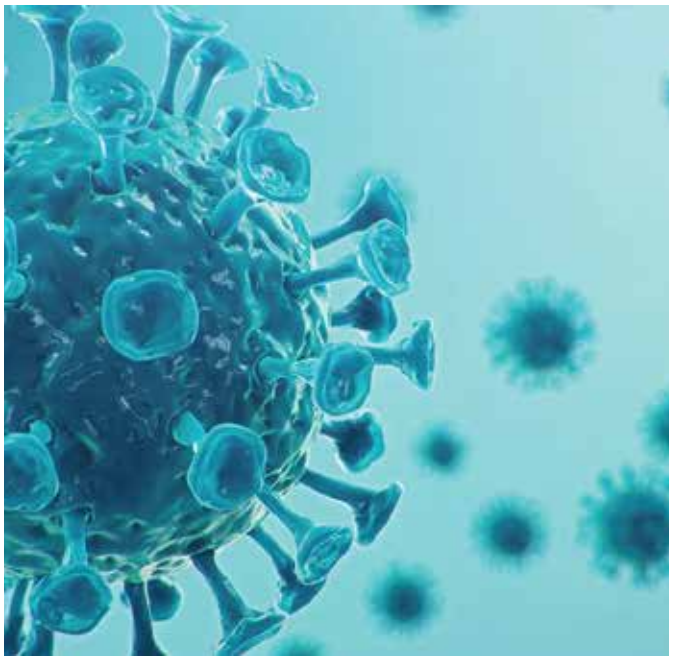
The AstraZeneca COVID-19 (AZD1222) coronavirus vaccine has been developed from a version of the common cold adenovirus [6]. The vaccine contains ChAdOx1, which includes the genetic sequence of the SARS-CoV-2 surface spike (S) protein.The S-protein located on the surface of SARS-CoV-2 is essential for the SARS-CoV-2 virus to infect host cells [6]. Most of the vaccines currently in clinical use have been developed using lipid nano particle-encapsulated mRNA, adenovirus 5 vector that expresses S-protein DNA, nucleoside modified RNA (modRNA) uridine containing Mrna (saRNA), electroporation of DNA plasmid encoding S protein, inactivated virus following viral propagation in cells with a SARS-CoV-2 clinical strain, lentiviral vector dendritic cells modification (LV-DCs and antigen-specific cytotoxic T lymphocytes (CTL) approaches and are schematically represented in Figure 1, the SARS-CoV-2 spike protein binds to ACE2 receptors in order to enter and infect human cells.

The production of a vaccine using spike protein may prime the immune system to attack the coronavirus in subsequent infections.

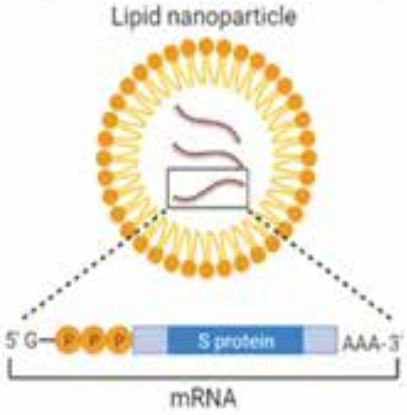
The spike protein is a major surface protein on the CoV virion and is the primary target for neutralising antibodies [7]. The S-protein undergoes dramatic structural re-arrangement when fusing the virus to the cell membrane of the host for viral genome delivery into the target cell. The 2 proline substitutions (2P) on the apex of the central helix stabilises the MERS-CoV, SARS-CoV and HCoV-HKU1 S protein [7].

The release of the SARS-CoV-2 sequence into the hose cell immediately triggers the manufacture of mRNA which expresses the prefusion-stabilised SARS-CoV-2 spike material (fig. 1) [8]. The mRNA-1273 induces potent neutralising antibodies and CD8 T-cell responses and provides protection against SARS-coV-2 [8]. Therefore mRNA-1273 detects and encodes the SARS-CoV-2 prefusion-stabilised spike protein.

BNT162b2 is lipid-nanoparticle formulation containing 5 nucleoside-modified RNA (modRNA) 6 which facilitates encoding of the full-length spike of SARS-CoV-2 [9]. The encoding is modified by two proline mutations for locking into the prefusion confirmation. The doses of BNT162b2 used result in high SARS-CoV-2 neutralising antibody levels in addition to responses from antigen-specific CD8+ and Th1-type CD4+ T-cells as depicted in Figure

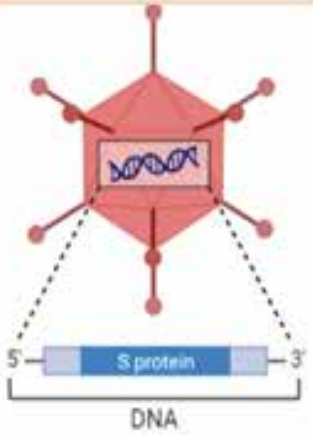


Moderna (mRNA-1273



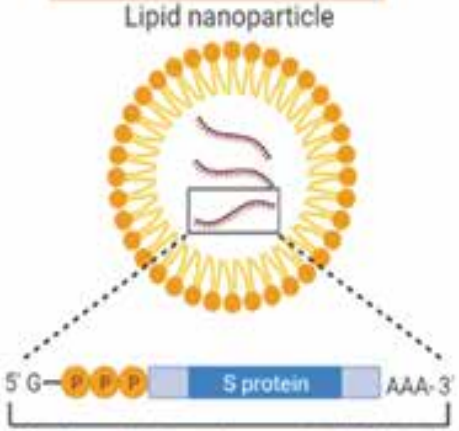
Platform: LNP-encapsulated mRNA encoding S protein.

AstraZeneca/Oxford's AZD 1222



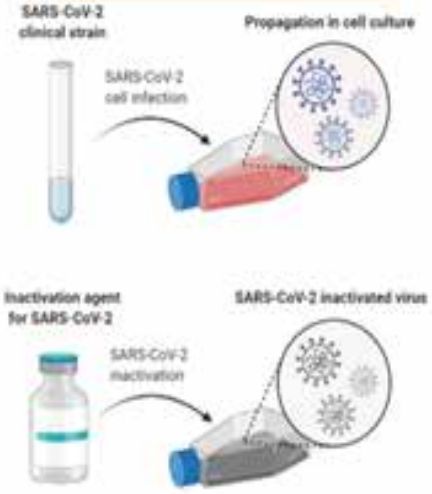
Platform: Adenovirus type 5 vector that expresses S protein.

Pfizer-BioNTech



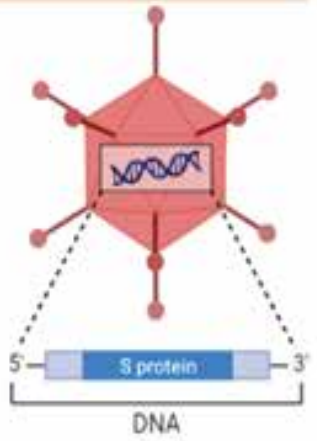
Platform: Nucleoside modified RNA (modRNA)
Uridine containing mRNA (uRNA)
Self-amplifying mRNA (saRNA)

Sinovac Biotech (Sinopharm)



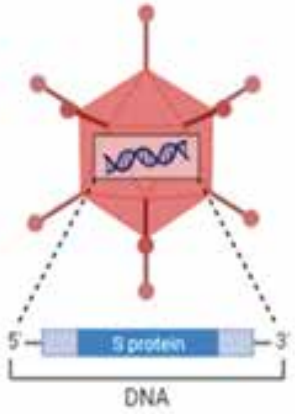
Platform: Inactivated virus vaccine produced from viral propagation in cells infected with a SARS-CoV-2 clinical strain.

Gamaleya (SputinK V)



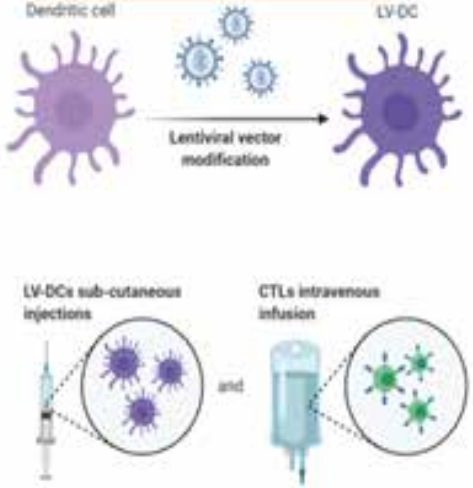
Platform: Adenovirus type 5 vector that expresses S protein.

Johnson and Johnson (Ad26.COV2.S)



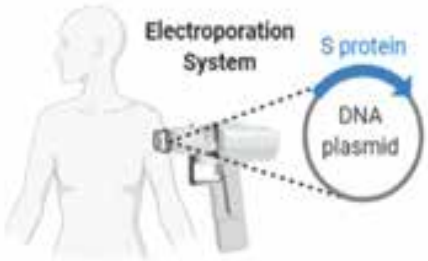
Platform: Genetically modified Adenovirus vector type 5 vector that expresses on S protein and uses double-stranded DNA.

Shenzhen Medical Institute (LV-SMENP-DC)



Platform: Lentiviral vector modification of dendritic cells (LV-DCs) and antigen-specific cytotoxic T lymphocytes (CTLs).

Inovio Pharma (INO-4800)



Platform: Electroporation of DNA plasmid encoding S protein.

3. Exploratory and Pre-Clinical Studies of SARS-CoV-2

Normally the development of new vaccines usually takes between 10 and 15 years whereas the development of a vaccine for COVID-19 over 12-24 months was astounding . The initial vaccine development phase or exploratory stage includes fundamental laboratory research augmented with computational modelling [11] to facilitate identification of natural or synthetic antigens which can be used as vaccine candidates. The second stage of the process includes pre-clinical studies in which cell or tissue culture and human model-based trials are used to establish the safety and immunogenicity of the test vaccine and/or an ability to provoke an immune response [12]. Initially safety, efficacy and immunogenicity are demonstrated in animal models after which clinical trials in small cohorts of human subjects are undertaken [12].

Due to the urgent need to develop prophylactic approaches against COVID-19, several vaccine candidates progressed to the clinical trial stage of development prior to demonstrating efficacy in animal models and provided the idea of pre-clinical research data were used to evaluate the Moderna mRNA vaccine candidate [13]. Vabret et al., the immunisation of mice with mRNA encoding alleviated perfusion and mediates CD8+ T cell response, whilst exhibiting dose-dependent neutralisation SARS-CoV-2 spike trimers by antibodies [14]. Two doses of the mRNA provided in a prime-boost combination to the mice prevented nasal mucosa and lung infections, after challenging SARS-CoV-2 infected mice, however, the trial did not show enhancement of immunopathology in animals receiving sub-protective doses [14].

4. Technology for COVID-19 Vaccine Design

There are many technologies being considered for COVID-19 vaccine development, including DNA, RNA, non-replicating viral vectors and inactivated vaccines [15]. DNA and RNA based vaccines were not developed aggressively nor licenced for human use previously therefore DNA and RNA based vaccines may not be an advantage during a pandemic situation [15]. However, in the light of available evidence DNA and RNA platforms do not require bioreactor culture techniques for production of an inactivated vaccine, and are easily developed in a laboratory as they are based on the genetic sequence of the virus [16]. For this reason DNA and RNA based vaccines for Covid management are under investigation [16]. In contrast non-replicating viral vaccines have been proven safe and effective and can be manufactured on a large scale [17]. As there is an urgent need for a COVID-19 vaccine in the current pandemic situation several DNA, RNA and non-replicating vaccines have been investigated using DNA and RNA platforms.

4.1 RNA Based Vaccines

4.1.1 Moderna mRNA-1273

Moderna is a US-based company that has developed a mRNA-based vaccine referred to as mRNA-1273 [18]. This vaccine codes for the production of spike proteins and administration of the vaccine results in immune cells present in the lymph nodes performing processing of mRNA, resulting in the marking of the protein in humans. The protein is subsequently recognised and marked for destruction. [18]. The Moderna vaccine forms part of the Operation Warp Speed initiative for accelerating the production of a usable vaccine. The preliminary Phase I trial data released by Moderna revealed that the vaccine, tested on mice by immunising them with the doses of 0.01, 0.1

or 1 µg, demonstrated a high pseudovirus NAb response with the 1 µg dose [13]. Moreover, the pseudovirus NAb response was also observed in mice who expressed a mutated form of the spike protein viz., D614G. The 1 µg dose demonstrated a robust and cytotoxic response by T-cells, and balanced responses of Th1/Th2 [13]. The mice did not exhibit increased pathology following administration of the 1 µg dose of vaccine. The Nab levels in mice in response to the 1 µg dose were comparable to that of a 100 µg dose in human subjects with the result that a 100 µg dose was considered necessary for carrying large scale efficacy trials.

4.1.2 BioNTech BNT162

The collaboration between the German company BioNTech and American company Pfizer resulted in the development of an mRNA-based vaccine for encoding the RBD domain of the SARS-CoV-2. The BNT162 product incorporates modified mRNA and includes a trimerisation domain derived from T4 fibritin [19]. For the phase I trial 45 healthy volunteers who were separated into groups to receive 10 µg, 30 µg, and 100 µg doses, were recruited and 9 participants received a placebo dose [19]. On the basis of the interim data, the participants demonstrated an increased level of IgG, which increased and remained elevated for 14 days following the second dose [19]. Individuals who received the 100 µg dose did not exhibit an increase for one day after vaccination, and exhibited peak IgG levels at 21 days following the initial dose [19]. The individuals who received the 100 µg dose did not receive the second booster dose and based on this information no difference between the health outcomes of individuals who received doses of 30 µg and 100 µg were observed [19].

4.2 Non-Replicating Viral Vectors Vaccines

The University of Oxford in partnership with AstraZeneca, a British pharmaceutical company, developed a viral vaccine, previously referred to as ChAdOx1. The pre-clinical trials for this vaccine were undertaken in a porcine model with a large antibody response observed [20]. A randomised controlled trial with 1077 healthy individuals was performed in the UK with participants receiving either 5 × 1010 vaccine particles or the meningococ

cal vaccine MenACWY [21]. The participants were further subdivided and categorised on the basis of paracetamol prophylaxis as this was used as a to reduce adverse events. The production of a recombinant adenovirus for ChAdOx1 nCoV-19 was undertaken and administered at a dose of 5 × 1010 viral particles dose by intramuscular injection [21]. Local and systematic events were fewer in individuals in the paracetamol group when compared to those individuals who received no prophylaxis [21]. However, liver enzyme upregulation through paracetamol use was not considered in this evaluation.

4.3 DNA-Based Vaccines

The American company Inovio developed the DNA-based INO-4800 vaccine. which is injected into the dermis after which electroporation is applied to ensure uptake into cells. The participants were divided into two groups who were administered a high (2mg) or low (1mg) dose [22]. The analysis of adverse events revealed that 28% of the individuals experienced Grade I adverse events after two months [22].

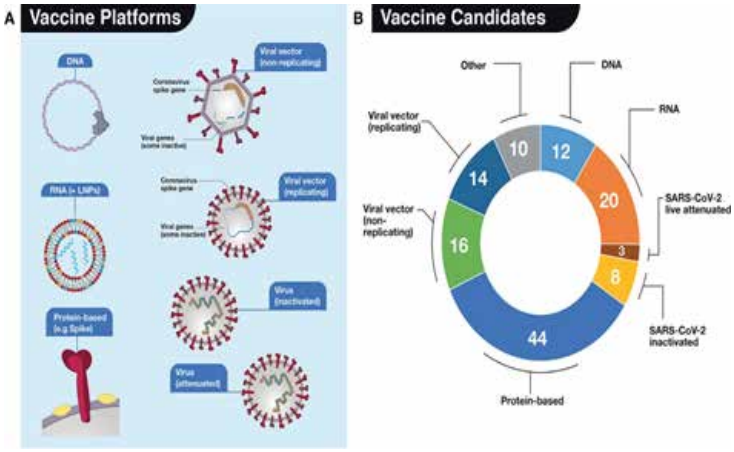


Figure 3: Vaccine platforms and candidates for SARS-CoV-2 and the COVID-19 (Adapted from Funk et al. [23])

5. Unpacking clinical trials data for SARS-CoV-2 vaccines currently under investigation

5.1 mRNA-1273

The primary endpoint for establishing the efficacy of the mRNA-1273 vaccine is the prevention of COVID-19 symptoms within at least 14-days following a second injection [24]. The efficacy levels of the mRNA-1273 were analysed and the consistency of the vaccine at the primary endpoint evaluated in subgroups for age, e health-related risk for severe disease, gender, race, and ethnic groups in addition to risk for COVID-19 [24]. A secondary endpoint was defined in terms of mRNA-1273 efficacy in preventing severe COVID-19, with reference to pre-defined criteria which included a respiration rate of > 30 breathes per minute, heart rate of > 125 beats per minute, oxygen saturation of 93% or lower less (the oxygen partial pressure to the oxygen reaction inspired ratio of < 300 mm Hg), acute respiratory distress syndrome and respiratory failure [24]. The criteria used included clinically significant neurologic, hepatic, renal dysfunction in addition to admission history to the intensive care unit. Some additional secondary endpoints included the efficacy of the vaccine to prevent COVID-19.Of interest solicited adverse events at the injection site were more frequent in the mRNA-1273 group compared to the placebo group [24]. Following the first dose, solicited adverse events totalled 84.2% in the mRNA-1273 and 19.8% in the control groups whereas, following the second dose the solicited adverse events were 88.6% in the mRNA-1273, and 18.8% in the control groups. The severity of injection site events in the mRNA-1273 group were reported as grade 1 and grade2 and observed more frequently in individuals who were SARS-CoV-2 positive at baseline when compared to subjects who were negative at the baseline [24].

The efficacy of mRNA-1273 vaccine was calculated by determining the difference in ratio of infected individuals in the control and vaccinated groups, respectively.

The number of individuals in the vaccine group was n1= 15000 and in the control group n2= 15000. In the vaccinated group, x1=11 individuals were infected by the virus, whereas in the control group x2=185 individuals were infected by the virus during the study [24]. The ratios of the infected individual within the vaccine group, 'r1' was 0.000733, whereas the ratios of the infected individual within the control group, 'r2' was 0.012333. The analysis of ratio of infection in the mRNA-1273, and placebo group revealed that a greater number of individuals were infected in the control group. Efficacy was determined by considering the difference in the ratios 'r1'and 'r2', which revealed that mRNA-1273, vaccine was 94% effective and facilitates removal of 94% of cases which would otherwise occur.

$$r1=x1/n1$$
$$r1=11/(15000\ )$$
$$r1=0.000733$$
$$r2=x2/n2$$
$$r2=185/15000$$
$$r2=0.012333$$
$$E=(r2-r1)/r2$$
$$E=(0.012333-0.000733)/0.012333$$
$$E=0.94$$
$$E=94\%$$

Where,

n1= Number of individuals in control group
n2= Number of individuals in vaccinated group
x1= Number of individuals in control group infected by virus
x2= Number of individuals in vaccinated group infected by virus
r1= Ratio of individuals in control group infected by virus to the total number of individuals in the control group
r2= Ratio of individuals in vaccinated group infected by virus to the total number of individuals in the vaccinated group
E= Difference in the ratios of infected individuals in the control and vaccinated groups.

5.2 BioNTech BNT162

The efficacy of the BNT162b2 vaccine by considering primary and secondary endpoints was reported by Polack et al. [9]. The primary endpoint was efficacy of BNT162b2 against confirmed cases of COVID-19 within at least 7 days onset following administration of the second dose and secondary endpoints included the efficacy of BNT162b2 against severe COVID-19 infection [9]. The effectiveness of the vaccine was estimated using,

Where,

IRR is the ratio of confirmed cases of COVID-19 illness per 1000 individuals.

Analysis of reactogenicity revealed that recipients of the BNT162b2 vaccines exhibited more local reactions and mild to moderate pain at the site of injection within seven days of treatment when compared to the placebo group [9]. Analysis of systemic reactogenicity revealed that events including headache and fatigue were experienced by 59% and 52% of the younger participant in the BNT162b2 group, whereas the event rate in the placebo group was comparatively lower after the first and second doses [9].

The number of individuals in the vaccine group was n1= 21720 and the control group n2= 21728. In the treatment group x1=8 individuals were infected by the virus, whereas, in the control group x2=162 individuals were infected by the virus [9]. The ratios of the infected individual within the vaccine group, 'r1' was 0.000368, whereas, the ratios of the infected individual within the control group, 'r2' was 0.007456. Analysis of the ratio of infection in the BNT162b2, and placebo groups revealed that a greater number of individuals were infected in the control group. In the analysis of data if the control group provides the rate of infection in the absence of using a vaccine, the number of infections eliminated by use of the vaccine in the other group is established by comparing the difference between r2 and r1 and in this case, it was found that the BNT162b2 vaccine was 95% effective and facilitates removal of 95% of cases which would otherwise occur

r1=x1/n1
r1=8/(21720)
r1=0.00036
r2=x2/n2
r2=162/21728
r2=0.007456
E=(r2-r1)/r2
r2=(0.007456-0.000368)/0.00
7456
E=0.95
E=95%

Where,
n1= Number of individuals in control group
n2= Number of individuals in vaccinated group
x1= Number of individuals in control group infected by virus
x2= Number of individuals in vaccinated group infected by virus
r1= Ratio of individuals in control group infected by virus to the total number of individuals in the control group
r2= Ratio of individuals in vaccinated group infected by virus to the total number of individuals in the vaccinated group
E= Difference in the ratios of infected individuals in the control and vaccinated groups.

5.3 AstraZeneca

According to the MHRA Information for Healthcare Professionals [25], the levels of protection following a single dose of the AstraZeneca vaccine were evaluated by exploratory data analysis by including participants who had received one dose of the vaccine [25]. Participant data were removed from the analysis performed as soon as possible following administration of the second dose, 12 weeks after the first dose [25].

Vaccine efficacy analysis revealed that 22 days post-dose, efficacy of the vaccine was 73% with 95% CI limits of 48.79 and 85.76 [25]. It was also observed that hospitalisation was reduced from 21 days after the first dose up to two weeks after the second dose. Consequently, it is likely that a single dose of the AstraZeneca vaccine will provide short-term protection against COVID-19 infection [25]. Protective immunity from the first dose was reported to last for up to 12 weeks. Exploratory analyses suggest that increased immunogenicity was highly correlated to a longer dose interval. In this exploratory trial the number of individuals in the vaccine group was n1= 7998 and the control, group n2= 7982 [25].

In the vaccinated group x1=12 individuals were infected by the virus following treatment whereas, in the control group, x2=44 individuals were infected by the virus. The ratio of infected individual within the vaccine group, 'r1' was 0.001500, whereas the ratio of the infected individual within the control group, 'r2' was 0.005512. Analysis of the ratio of infection with the AstraZeneca vaccine and placebo groups revealed that a greater number of individuals were infected in the control group.

r1=x1/n1
r1=12/(7998)
r1=0.001500
r2=x2/n2
r2=44/(7982)
r2=0.005512
E=(r2-r1)/r2
E=(0.005512-0.001500)/0.005
512

E=0.72786
E=73%

Where,
n1= Number of individuals in control group
n2= Number of individuals in vaccinated group
x1= Number of individuals in control group infected by virus
x2= Number of individuals in vaccinated group infected by virus
r1= Ratio of individuals in control group infected by virus to the total number of individuals in the control group
r2= Ratio of individuals in vaccinated group infected by virus to the total number of individuals in the vaccinated group
E= Difference in the ratios of infected individuals in the control and vaccinated groups.

6. Uncovering Clinical Data

6.1 Johnson and Johnson

The efficacy and safety of the Janssen COVID-19 candidate vaccine for protection against moderate to severe COVID-19 was evaluated in a phase 3 clinical trial by considering co-primary endpoints of 14 and 28 days after vaccination [26]. It was found that the Janssen candidate was 66% effective for the prevention of moderate to severe COVID-19 at 28 days after vaccination. A single dose of the Johnson & Johnson vaccine showed a 66% percent effectiveness at preventing moderate to severe disease from COVID-19 and 85% at preventing severe disease. However, there were variations in efficacy in regional clinical trials when evaluated for moderate to severe COVID-19 with a 72% effectiveness in the United States, 57% in South Africa and 66% in Latin America reported. The vaccine also exhibited good results when multiple variants of COVID-19, such as B.1.351 variant found in South Africa were tested.

Johnson and Johnson [27] reported that the onset of protection was also observed as early as the 14th day of infection. The Janssen COVID-19 vaccine provided complete protection against COVID-related hospitalisation and death 28 days after vaccination. The vaccine was reported to have a clear effect on the number of COVID-19 cases requiring extracorporeal membrane oxygenation (ECMO), mechanical ventilation, or other medical interventions.

6.2 Gamaleya

The Sputnik V vaccine developed by Gamaleya is based on a human adenoviral vector platform and makes use of adenovirus 26 (Ad26) and 5 (Ad5) as vectors to express the genetic sequence of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) spike protein [28]. Logunov et al. [28] reported the interim results from a phase 3 clinical trial of the Sputnik V COVID-19 vaccine and the results revealed that the vaccine provided strong protection in all age groups that participated [29]. The efficacy of the vaccine established by monitoring confirmed cases of COVID-19 from 21 days after vaccine administration revealed 91.6% efficacy (95% CI 85•6–95•2) [29] and was equally effective in individuals in all age groups.

6.3 Sinopharm

Sinopharm, a pharmaceutical company based in the Republic of China, have developed an inactivated SARS CoV-2 vaccine, which has been administered to approximately 1 million individuals [30]. Additional phase 3 trials of the vaccine are currently being undertaken in Indonesia and Turkey [30]. In Brazil, the vaccine has been administered intramuscularly to participants in two different doses provided at an interval of 14 days [30]. The Sinopharm vaccine has been reported to be 79% effective [31] however, efficacy trials on the same product have p

roduced efficacy data of 50%, 65%, 78% and 91% [32].

7.Ethical Considerations Surrounding Vaccine Development and Production

A concerted application of science and technology is required to ensure that the research undertaken in respect of the COVID-19 outbreak includes risk assessment, management, vaccine development, and production whilst always promoting human rights. The development and production of an effective vaccine for dealing with the pandemic is y dependent on the outcomes of appropriately designed clinical and non-clinical trial outcomes performed in vitro, in animal and human subjects [33]. For this reason, there is a bioethical debate surrounding the trials conducted in respect of these vaccines developed during the pandemic. In respect of the COVID-19 situation, no vaccine has been proven to be effective for treatment of the disease and therefore an ethical dilemma when including healthy subjects for testing the efficacy of the vaccine exists [34]. The development and production of vaccines during pandemics is always likely to raise ethical concerns.

8. Challenges of Acquisition and Distribution of SARS-CoV-2 Vaccine in Middle- and Low-Income Developing Nations.

The rapid spread of the contagion crosses the globe and within less developed countries in Asia and Africa has resulted in a significant global health emergency. Countries require context-specific responses dependent on the prevailing situation such as number of COVID-19 cases ranging from none to a limited number or increased number of cases [32]. Decisive actions are required and effective physical (social) distancing, use of quarantine and/or lockdowns, implementation of widespread testing, contact tracing in a systematic manner are necessary to reduce the risk of further spread of the disease [32]. In combination with extensive testing the distribution of vaccines in low income developing counties is a significant challenge due to conflict, over population in rural and urban areas, and lack of accessibility to basic health services [30]. In developing countries, the most significant challenge includes the need for systematic decontamination measures and massive testing to reduce the risk of a devastating outbreak. The acquisition of COVID-19 vaccines requires an in-depth analysis of the changing epidemiology of the disease including the period of incubation between appearance and duration of symptoms [35].

The distribution of a vaccine is currently determined by considering an ability to develop and initiate testing and purchase vaccines [35]. A small number of multinational companies produce most of the vaccines globally and are also involved in negotiating with the private and public[36] sectors to sell their vaccines. In this respect developed countries of the

world attempt to purchase access to vaccine candidates well in advance whereas due to a lack of resources, developing countries are unlikely to have early access the vaccines [35]. Consequently there is likely to be inequitable access and an unethical allocation of vaccines, depending on the ability of countries to pay for vaccines and distributive justice is one of the fundamental considerations necessary when distributing vaccines during such a pandemic so as to ensure that the principles of distributive justice are met and the allocation of scarce resources are applied equally to all viz., local, national and global communities [35]. However, the limited supply of vaccines and the mass demand during pandemic situations is a challenge when aspiring to equal distribution of resources.

The lack of accessibility to vaccines and storage conditions required may result in failure to achieve desired clinical outcomes even if bulk distribution of vaccines to developing countries was successful [31]. The inadequate refrigerated cold chain network in many developing countries therefore poses a significant challenge. Consequently vaccine candidates for COVID-19 requires that require long term storage at -20 °C to -70°C are likely to result in the loss of vaccine particularly if inadequate refrigerated cold chain networks exist [32]. Therefore, the acquisition, distribution and successful clinical application of SARS-CoV-2 vaccine in low- and middle-income developing nations may be extremely challenging.

9. Conclusions

In light of the analysis and review of the vaccines that have been developed and approved for emergency use in many countries it is evident that grey areas exist and scientists are yet to establish conclusive solutions to ensure successful treatment strategies. Similar concerns are shared by the World Health Organization (WHO) in that assurance of long-term immunity or estimated time of immunity protection with the current vaccines are not yet known. In addition, there is no certainty of immune response or durability thereof. Evidence from the clinical trial data has revealed that the current vaccines have a e capability to protect some individuals against disease but are not conclusive in respect of an ability to prevent transmission and subsequent infection following exposure to the COVID-19 virus.

Furthermore, there is a dearth of evidence regarding the age-related use of these vaccines as, by way of example, the use of the vaccine in paediatric subjects has not yet been undertaken and efficacy established and as such these populations remain at risk to transmission and infection by the virus.

An additional concern relates to the availability of the sufficient vaccine doses to cater for entire communities and/or populations so as to ensure protection to a significant number and wide range of individuals, which may reduce confidence in the current intervention strategy and fight against COVID-19.

Consequently, it is recommended that adherence to COVID-19 protocols such as hand sanitization, physical distancing and wearing of masks is maintained despite the state of vaccination of an individual or population as the COVID-19 pandemic

REFERENCES

Randolph, H.E.; Barreiro, L.B. Herd Immunity: Understanding COVID-19. Immunity 2020, 52, 737–741, doi:10.1016/j.immuni.2020.04.012.

2. Jung, F.; Krieger, V.; Hufert, F.T.; Küpper, J.H. Herd immunity or suppression strategy to combat COVID-19. Clin. Hemorheol. Microcirc. 2020, 75, 13–17, doi:10.3233/CH-209006.

3. Netea, M.G.; Joosten, L.A.B.; Latz, E.; Mills, K.H.G.; Natoli, G.; Stunnenberg, H.G.; O'Neill, L.A.J.; Xavier, R.J. Trained immunity: A program of innate immune memory in health and disease. Science (80-.). 2016, 352, 427, doi:10.1126/-science.aaf1098.

4. Grifoni, A.; Weiskopf, D.; Ramirez, S.I.; Mateus, J.; Dan, J.M.; Moderbacher, C.R.; Rawlings, S.A.; Sutherland, A.; Premkumar, L.; Jadi, R.S.; et al. Targets of T Cell Responses to SARS-CoV-2 Coronavirus in Humans with COVID-19 Disease and Unexposed Individuals. Cell 2020, 181, 1489-1501.e15, doi:10.1016/j.-cell.2020.05.015.

5. Johnson, Z.I.; Zinser, E.R.; Coe, A.; McNulty, N.P.; Woodward, E.M.S.; Chisholm, S.W. Niche partitioning among Prochlorococcus ecotypes along ocean-scale environmental gradients. Science (80-.). 2006, 311, 1737–1740, doi:10.1126/science.1118052.

6. Mellet, J.; Pepper, M.S. A covid-19 vaccine: Big strides come with big challenges. Vaccines 2021, 9, 1–14, doi:10.3390/vac-cines9010039.

7. Anderson, E.J.; Rouphael, N.G.; Widge, A.T.; Jackson, L.A.; Roberts, P.C.; Makhene, M.; Chappell, J.D.; Denison, M.R.; Stevens, L.J.; Pruijssers, A.J.; et al. Safety and Immunogenicity of SARS-CoV-2 mRNA-1273 Vaccine in Older Adults. N. Engl. J. Med. 2020, 383, 2427–2438, doi:10.1056/nej-moa2028436.

8. Dong, Y.; Dai, T.; Wei, Y.; Zhang, L.; Zheng, M.; Zhou, F. A systematic review of SARS-CoV-2 vaccine candidates. Signal Transduct. Target. Ther. 2020, 5, doi:10.1038/s41392-020-00352-y.

9. Polack, F.P.; Thomas, S.J.; Kitchin, N.; Absalon, J.; Gurtman, A.; Lockhart, S.; Perez, J.L.; Pérez Marc, G.; Moreira, E.D.; Zerbini, C.; et al. Safety and Efficacy of the BNT162b2 mRNA Covid-19 Vaccine. N. Engl. J. Med. 2020, 383, 2603–2615, doi:10.1056/nejmoa2034577.

10. Biorender Immunogeneci-ty to SARS-CoV-2 2021.

11. Han, S. Clinical vaccine development. Clin. Exp. Vaccine Res. 2015, 4, 46, doi:10.7774/cevr.2015.4.1.46.

12. Singh, K.; Mehta, S. The clinical development process for a novel preventive vaccine: An overview. J. Postgrad. Med. 2016, 62, 4–11, doi:10.4103/0022-3859.173187.

13. Corbett, K.S.; Edwards, D.K.; Leist, S.R.; Abiona, O.M.; Boyoglu-Barnum, S.; Gillespie, R.A.; Himansu, S.; Schäfer, A.; Ziwawo, C.T.; DiPiazza, A.T.; et al. SARS-CoV-2 mRNA vaccine design enabled by prototype pathogen preparedness. Nature 2020, 586, 567–571, doi:10.1038/s41586-020-2622-0.

14. Vabret, N. Antibody responses to SARS-CoV-2 short-lived. Nat. Rev. Immunol. 2020, 20, 519, doi:10.1038/s41577-020-0405-3.

15. Sharma, O.; Sultan, A.A.; Ding, H.; Triggle, C.R. A Review of the Progress and Challenges of Developing a Vaccine for COVID-19. Front. Immunol. 2020, 11, doi:10.3389/fimmu.2020.585354.

16. Conforti, A.; Marra, E.; Roscilli, G.; Palombo, F.; Ciliberto, G.; Aurisicchio, L. Are Genetic Vaccines the Right Weapon against COVID-19? Mol. Ther. 2020, 28, 1555–1556, doi:10.1016/j.ymthe.2020.06.007.

17. Sharpe, H.R.; Gilbride, C.; Allen, E.; Belij-Rammerstorfer, S.; Bissett, C.; Ewer, K.; Lambe, T. The early landscape of coronavirus disease 2019 vaccine development in the UK and rest of the world. Immunology 2020, 160, 223–232, doi:10.1111/imm.13222.

18. Triggle, C.R.; Bansal, D.; Farag, E.A.B.A.; Ding, H.; Sultan, A.A. COVID-19: Learning from Lessons To Guide Treatment and Prevention Interventions. mSphere 2020, 5, doi:10.1128/msphere.00317-20.

19. Mulligan, M.J.; Lyke, K.E.; Kitchin, N.; Absalon, J.; Gurtman, A.; Lockhart, S.; Neuzil, K.; Raabe, V.; Bailey, R.; Swanson, K.A.; et al. Phase I/II study of COVID-19 RNA vaccine BNT162b1 in adults. Nature 2020, 586, 589–593, doi:10.1038/s41586-020-2639-4.

20. Graham, S.P.; McLean, R.K.; Spencer, A.J.; Belij-Rammerstorfer, S.; Wright, D.; Ulaszewska, M.; Edwards, J.C.; Hayes, J.W.P.; Martini, V.; Thakur, N.; et al. Evaluation of the immunogenicity of prime-boost vaccination with the replication-deficient viral vectored COVID-19 vaccine candidate ChAdOx1 nCoV-19. bioRxiv 2020, doi:10.1101/2020.06.20.159715.

21. Folegatti, P.M.; Ewer, K.J.; Aley, P.K.; Angus, B.; Becker, S.; Belij-Rammerstorfer, S.; Bellamy, D.; Bibi, S.; Bittaye, M.; Clutterbuck, E.A.; et al. Safety and immunogenicity of the ChAdOx1 nCoV-19 vaccine against SARS-CoV-2: a preliminary report of a phase 1/2, single-blind, randomised controlled trial. Lancet 2020, 396, 467–478, doi:10.1016/S0140-6736(20)31604-4.

22. Tebas, P.; Yang, S.P.; Boyer, J.D.; Reuschel, E.L.; Patel, A.; Christensen-Quick, A.; Andrade, V.M.; Morrow, M.P.; Kraynyak, K.;

THE EFFECTS OF MATERNAL SMOKING ON INFANT DEVELOPMENT

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Abstract|

The study attempt to investigate the effect of maternal smoking on an infant's development. In addition, the study considered mothers who smoked before pregnancy, mothers who smoked or where exposed to smoked tobacco containing substance during pregnancy and mothers who smoked or where exposed to tobacco containing substance after delivery (during the period of nursing their babies from 0year old up to 2 years old). Maternal smoking is a prime health care concern and by definition, refers to smoking before, during and or after gestation. The rationale for this systematic review is to evaluate and highlight the effects of maternal smoking on infants.

Key words| Effects, maternal, smoking, infants

Background

Maternal smoking is a prime health concern meaning to smoke before, during and after gestation (Little, R.E., 1977). Early life exposure to tobacco smoke products has been linked to causing adversely effect on maternal health childhood (Young, S., et al 1991). Some of the key manifestations that come about due to maternal smoking are increased airways responsiveness which was found among young infants born smoking mothers was diminished in babies of mothers who smoked during pregnancy, compared to babies of mothers who did not [Hanrahan JP., et al 1992]. Also an increased risk of 9 | P a g e asthma was reported at 8–11 yrs of age in children exposed to maternal smoking only whilst in utero compared to non-exposed children (Cunningham J, et al 1996). Other researchers have debated that in-utero exposure to the products of cigarette leads to reduced respiratory function in young infants (Hanrahan, J.P., et al 1992).

Environmental tobacco smoke causes wheezing, and asthma in children in 24 communities Thus, early exposure to tobacco smoke appears to be a risk factor for reduced lung function as well as obstructive airways disease (OAD). Implications of reduced lung function soon after birth are not well established. Premorbid flow limitation has been reported during the first months of life among children who subsequently wheezed by 2 yrs of age.

EFFECTS OF MATERNAL SMOKING

Tobacco use during pregnancy is toxic and a harmful human process that causes adverse effects on milestones development and increase cases of mortality for infants (Antonio Luca Gianicolo, E., et al 2010). For this reason, mothers who smoke while pregnant are recognized as a highly fundamental modifiable risk factor associated with harmful perinatal outcomes (Jauniaux, E., et al 2007). Despite known negative consequences, epidemiological studies have shown that between 11 and 30% of pregnant women smoke or are exposed to second-hand smoke, with an increase to 50% in

high-exposed samples, including young, poor and urban populations (Mathews TJ et al 2001). Nonetheless, in many developed countries, the rates of women who actively smoke appear to have peaked and have now begun to drop (Ventura, S.J., et al 2001).

RESEARCH AIM

To conduct a systematic review of the effects of maternal smoking on infant development.

OBJECTIVE

1. To determine the effects of maternal smoking on infants developmen.

2. To To determine the burden maternal smoking has on infants in pack years including infants' developmental changes born by women who smoked during pregnancy from birth to through 2 years of age.

METHODOLOGY

In order to answer the aims and objectives of the research topic, secondary data was systematically reviewed. The databases used for attaining the information included PubMed, Google scholar. The utilization of the multiple databases presented the opportunity to gain accurate and reliable information that signified the primary aspects of the study. Also, the research study used the PRISMA tool for screening the research resources.

RESULTS

Amongst the numerous effects that exist in infants exposed to smoking by their mothers referring to the 8 studied articles,neurobehaviours and abrupt demise sowed 50%,birth weight 80%of the impact ,with crown heel length,hed circumference,pondral index and brain ,body weight index at 25%, while attention defits and respiratory complications showed 35.7% of impact.

Fig 1.0 | Prisma Flow Chart

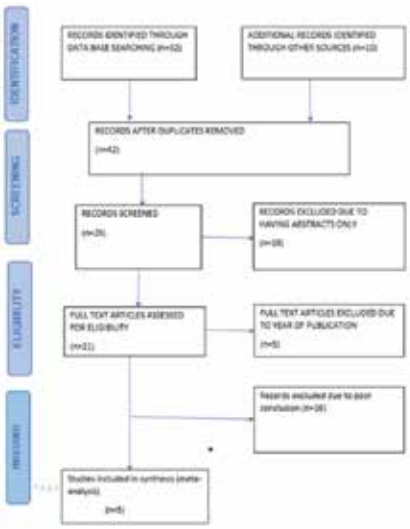

Fig 1.2| KEY RESULTS AND DISCUSSION

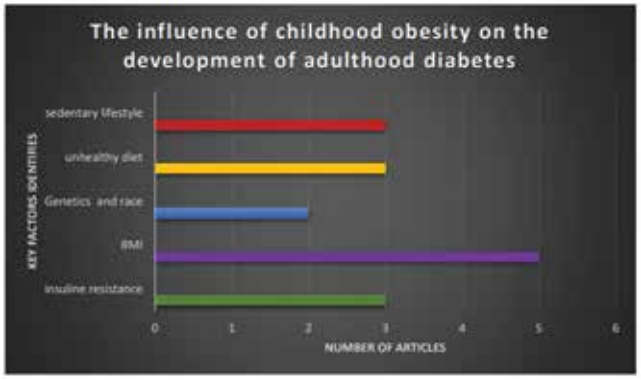

Fig 1.2| KEY RESULTS AND DISCUSSIONDATA ANALYSIS AND INTERPRETATION

NEUROBEHAVIOUR The NICU Network Neurobehavioral Scale (NNNS) was administered by masked examiners in hospital to measure neurobehavioral function. NNNS scores were compared between nicotine-exposed and -unexposed groups including adjustment for covariates. Dose-response relationships with NNNS scores were computed for maternal salivary cotinine and maternal report of number of cigarettes per day during pregnancy(Karen, L,. et al Z-exposed infants were more excitable and hypertonic, required more handling and showed more stress/abstinence signs, specifically in the central nervous system (CNS), gastrointestinal, and visual areas. Dose-response relationships showed higher maternal salivary cotinine values related to more stress/abstinence signs (r = .530) including CNS (r = .532) and visual stress (r = .688) and higher excitability scores (r = .617). Cigarettes per day during pregnancy was related to more stress/abstinence signs (r = .582) including CNS (r = .561) and visual stress (r = .640) (Stroud ,R L et,. Al 2003). 4.1.2.

BIRTH WEIGHT 36 | P a g e Maternal cigarette utilization has been obviously connected with an expanded frequency of low birth weight neonates. The best wellspring of this impact seems, by all accounts, to be a decrease in fetal development speed as opposed to an expansion in the recurrence of preterm birth.(Sexton M,. et al 1984).Infants conceived by mothers who smoke tend to be a few hundred grams smaller, on average, than the infants of nonsmokers. This impact on fetal development is viewed as proof of the conceptive lethality of cigarette smoking (Wilcoz A j,. et al 1993). The mean birth weight is 3,459 g (95 percent certainty interim (CI): 3,444, 3,474). Smoking at the lower level all through pregnancy was related with a lessening in birth weight of 136 g (95 percent CI: −109, −162).- Smoking at the higher level all through pregnancy was related with an abatement in birth weight of 175 g (95 percent CI: −146, −203) (Meis, P J,. et al 1997). For newborn children of ladies who quit smoking sometime between the primary pre-birth care visit and the 32nd seven day stretch of pregnancy, the birth weight contrasts contrasted and babies of non-smokers were not measurably huge. (Goldenberg, R L,. et al 1995). 4.1.3

CROWN-HEEL LENGTH Crown heel length is the measurement of the length of human embryos and foetuses from the top of the head (crown) to the bottom of the buttocks (rump). It is typically determined from ultrasound imagery and can be used to estimate gestational age. The balanced mean an incentive for crown-heel length among nondaily smokers is 49.94 cm (95 percent CI: 49.88, 50.00). Kept smoking at the lower level was related with a lessening in crown-heel length of 0.62 cm (95 percent CI: 0.50, 0.74), while kept smoking at the higher level was related with a decline of 0.89 cm (95 percent CI: 0.77, 1.01) (O'Callaghan, M J,. et al 1997). There was a measurably noteworthy deficiency in crown-heel length among the new-born children of smokers who quit smoking between the principal pre-birth care visit and the 32nd seven day stretch of pregnancy. This shortfall was 0.23 cm (95 percent CI: 0.07, 0.39) (Michielutte, R,. et al 1997). 4.1.4

HEAD CIRCUMFERENCE infants of smoking mothers were at an increased risk of small head circumference for gestational age, of about <32 cm compared to infants of non-smoking mothers.(Kallen K et al 2000) The relapse catch an incentive for head circumference is 34.43 cm (95 percent CI: 34.39, 34.47). Kept smoking at the lower level was related with a factually critical lessening in head perimeter of 0.37 cm (95 percent CI: −0.31, −0.43), while kept smoking at the higher level was related with a measurably noteworthy abatement in head periphery of 0.41 cm (95 percent CI: −0.35, −0.47). No impact on head circuit was seen among the newborn children of moms who quit smoking. (Horta, B L,. et al 1997). 4.1.5.

PONDERAL INDEX 39 | P a g e The ponderable index relapse controlled for the baby's introduction to the world weight Z score just as for the elements controlled for in the other relapse examinations (table 2 references). The mean ponderable record an incentive for nondaily smokers' babies is 2.803 (95 percent CI: 2.795, 2.811). Kept smoking all through pregnancy was related with an expansion in ponderable file of 0.029 for moderate smoking (95 percent CI: 0.017, 0.041) and 0.040 for substantial smoking (95 percent CI: 0.026, 0.054) (Figueras, J,. et al 1995). Babies of smokers who quit smoking had a factually critical increment in ponderable list of 0.027 (95 percent CI: 0.009, 0.045) contrasted and the newborn children of non-smokers of a similar birth weight and gestational age.

At the end of the day, when smokers' newborn children were contrasted and non-smokers' babies who all things considered had a comparative level of development (as estimated by birth weight Z score), the smokers' newborn children had a higher ponderable file, being apparently shorter for a similar birth weight. A portion of this smoking impact was obvious notwithstanding when the moms had quit smoking right off the bat in pregnancy (Cnattingius, S,. et al 1984). 4.1.6

DECREASE IN BRAIN: BODY WEIGHT RATIO The mean BBR (Brain; Body weight Ratio) in this gathering was 9.456 (95 percent CI: 9.427, 9.485). Kept smoking all through pregnancy was related with declines in BBR of 0.074 for moderate smoking (95 percent CI: −0.031, −0.117) and 0.046 for substantial smoking (95 percent CI: −0.001, −0.091). The newborn children of ladies who quit smoking between the main pre-birth care visit and week 32 of pregnancy were factually vague from the babies of nondaily smokers regarding their BBRs (Miller, H C,. et al 1989). At the end of the day, when we contrasted smokers' babies and non-smokers' newborn children with the equivalent gestational age and birth weight, the smokers' babies had excessively littler heads (and apparently made up the weight in some other body measurement). Be that as it may, the newborn children of ladies who quit smoking before week 32 of pregnancy were the same in their BBRs from non-smokers' babies of a similar birth weight and gestational age (Jekel, J F,. et al 1989). 4.1.7

ATTENTION DEFICITS Numerous studies have found a significant association between prenatal environmental tobacco smoke (ETS) exposure and ADHD or ADHD-related behaviours, even after controlling for postnatal ETS exposures and familial psychopathology (Day et al. 2000). Children who have ADHD are at increased risk for conduct disorder, antisocial behavior, and drug abuse later in life (Costello et al. 2003). Moreover, the costs associated with their medical care and education are substantial (Leibson et al. 2001) 4.1.8

RESPIRATORY COMPLICATIONS Newborn children presented to smoking in their initial life has a higher danger of creating lower respiratory contaminations (Colley, J.R.T., et al 1974) Prenatal smoking is a hazard fator for asthma in paediatrics (Von Mutius, E., 2002).The overabundance occurrence of wheezing in smoking family units gives off an impression of being generally non-atopic "wheezy bronchitis", which has a moderately kind anticipation. Along these lines, postnatal ecological tobacco smoke presentation can be named as a co-factor exasperating wheezing assaults, as opposed to a reason for the fundamental asthmatic propensity (Von Mutius, E., 2002).

The motivation behind why pre-birth detached smoking is related with paediatric asthma, and postnatal inactive smoking is related with non-atopic "wheezy bronchitis", stays to be clarified. Conceivably, a decrease in lung work because of pre-birth aloof smoking (Fletcher, M.E., et al 1999) makes the kids increasingly powerless for respiratory side effects, and in this way empowers the conclusion of paediatric asthma. Moreover, the refinement between wheezy bronchitis and asthma can be exceptionally troublsome, and it appears to be possible that they can coincide also. Among kids with set up asthma, parental smoking is related with increasingly serious illness (Redd, S.C., et al 2002) In newborn children destined to smoking moms lung

capacity tests demonstrate a decrease in constrained expiratory streams contrasted with babies destined to nonsmoking moms (Lahey, B.B., et al 1999). Pre-birth maternal smoking expands the hazard for symptomatic paediatric asthma (Von Mutius, E., 2002).

ABRUPT NEWBORN CHILD DEMISE DISORDER Abrupt newborn child demise disorder (SIDS) is the unexpected passing of an infant from birth to 2 years that remaining parts unexplained after a careful case examination that incorporates a post-mortem examination, a passing scene examination, and a survey of the clinical history of the guardians and the baby (Byard, R.W. what's more, Krous, H.F., 2003). Realized hazard factors for SIDS incorporate dozing in the inclined position, being presented to smoke pre-and postnatal, imparting a bed to a mother who smokes, hyperthermia, absence of breastfeeding, and resting on delicate surfaces (Shah, T., Sullivan, K. furthermore, Carter, J., 2006). Despite the fact that the pace of SIDS cases in the United States diminished by 40% from 1992to 1999, the top health spokesperson reports that smoking rates during pregnancy might be as high as 22% (Shah, T., et al 2003). As appeared by Guntheroth in low-salary ladies (Garrett, B.E., et al 2011), pre-birth introduction to smoking likely methods presentation to smoking during pregnancy and after pregnancy too an orderly survey inferred that in the wake of modifying for confounders, for example, dozing position and financial tatus, maternal smoking pairs the hazard for SIDS (Anderson, H.R. what's more, Cook, D.G., 1997).

CONCLUSION

In summary, we can clinch that maternal smoking is a health hazard that affect infants' formation and continues to their poor development. Maternal smoking effects onWe conclude that active and passive smoking during pregnancy affects several aspects of neurobehavioral development, regardless of socio-demographic, obstetric and paediatric factors. SIDS rates expanded with the sum smoked by all mothers. Smoking is one of the most significant preventable hazard factors for SIDS, and smoking counteractive action/mediation projects can possibly generously bring down SIDS rates. Children of mothers who smoked during pregnancy showed more signs of attention deficit and displayed higher levels of troublesome (externalising) behaviour than noncigarette-exposed children.

Smoking during pregnancy is known to markedly affect fetal development, expanding the danger of having a little for-gestational-age newborn child, lessening newborn child birth weight, crown heel length), and head periphery, and influencing 45 | P a g e markers of baby body proportionality, for example, ponderal record(characterized as 100 × [birth weight (g)/crown-heel length (cm)3]) and brain:body weight proportion (BBR) (characterized as 100 × the proportion of assessed cerebrum weight to birth weight). Discontinuance of smoking during pregnancy has been found to moderate the smoking related deficiencies in birth weight and crown-heel length in emergency clinic based associates. Notwithstanding, the distinctive physical elements of the newborn child have their pinnacle times of development during various times of pregnancy .Hence, smoking during the early piece of incubation may at present influence newborn child measurements and body extents regardless of whether the mother stops smoking halfway through her pregnancy.

REFERENCES

Al-Turki, H.A., 2012. Prevalence and risk factors in women attending a tertiary care hospital in Saudi Arabia. Saudi Med J, 33(8), pp.875-878.

Amaratunga, D., Baldry, D., Sarshar, M. and Newton, R., 2002. Quantitative and qualitative research in the built environment: application of "mixed" research approach. Work study, 51(1), pp.17-31.

Andres, R.L. and Day, M.C., 2000, August. Perinatal complications associated with maternal tobacco use. In Seminars in Neonatology (Vol. 5, No. 3, pp. 231-241). WB Saunders.

Antonio Luca Gianicolo, E., Cresci, M., Ait-Ali, L., Foffa, I. and Grazia Andreassi, M., 2010. Smoking and congenital heart disease: the epidemiological and biological link. Current pharmaceutical design, 16(23), pp.2572-2577.

Bassi, J.A., Rosso, P., Moessinger, A.C., Blanc, W.A. and James, L.S., 1984. Fetal growth retardation due to maternal tobacco smoke exposure in the rat. Pediatric research, 18(2), p.127. Becker, S. and Soukup, J.M., 1999. Effect of nitrogen dioxide on respiratory viral infection in airway epithelial cells. Environmental research, 81(2), pp.159-166. Bernstein IM, Goran MI, Amini SB, et al. Differential growth of fetal tissues during the second half of pregnancy. Am J Obstet Gynecol 1997; 176:28–32? 48 | P a g e

Bernstein, I.M., Mongeon, J.A., Badger, G.J., Solomon, L., Heil, S.H. and Higgins, S.T., 2005. Maternal smoking and its association with birth weight. Obstetrics & Gynecology, 106(5), pp.986-991.

Blood-Siegfried, J. and Rende, E.K., 2010. The long-term effects of prenatal nicotine exposure on neurologic development. Journal of midwifery & women's health, 55(2), pp.143-152.

Brodsky, D. and Christou, H., 2004. Current concepts in intrauterine growth restriction. Journal of intensive care medicine, 19(6), pp.307-319.

Brook, J.S., Brook, D.W. and Whiteman, M., 2000. The influence of maternal smoking during pregnancy on the toddler's negativity. Archives of pediatrics & adolescent medicine, 154(4), pp.381-385. Bush, P.G., Mayhew, T.M., Abramovich, D.R., Aggett, P.J.,

Burke, M.D. and Page, K.R., 2000. A quantitative study on the effects of maternal smoking on placental morphology and cadmium concentration. Placenta, 21(2-3), pp.247-256. Button, T.M.M., Maughan, B. and McGuffin, P., 2007. The relationship of maternal smoking to psychological problems in the offspring. Early human development, 83(11), pp.727-732.

Camp, D.E., Klesges, R.C. and Relyea, G., 1993. The relationship between body weight concerns and adolescent smoking. Health psychology, 12(1), p.24.

Cartwright, K. ed., 1995. Meningococcal disease (pp. 115-146). Chichester: Wiley. Chrisman, J.J., Chua, J.H. and Sharma, P., 2005. Trends and directions in the development of a strategic management theory of the family firm. Entrepreneurship theory and practice, 29(5), pp.555-575.

Cliver SP, Goldenberg RL, Cutter GR, et al. The effect of cigarette smoking on neonatal anthropometric measurements. Obstet Gynecol 1995; 85:625–30. Cnattingius S, Axelsson O, Elklund G, et al. Factors influencing birth weight for gestational age with special respect to risk factors for intrauterine growth retardation. 49 | P a g e Early Hum Dev 1984; 10:45–55. Cnattingius S, Ericson A, Gunnarskog J, et al. A quality study of a medical birth registry. Scand J Soc Med 1990; 18:143–8. Cnattingius S, Lindmark G, Meirik O. Who continues to smoke while pregnant? J Epidemiol Community Health 1992; 46:218–21 Colley, J.R.T., Holland, W.W. and Corkhill, R.T., 1974. Influence of passive smoking and parental phlegm on pneumonia and bronchitis in early childhood. The Lancet, 304(7888), pp.1031-1034.

Collins, M.H., Moessinger, A.C., Kleinerman, J.E.R.O.M.E., Bassi, J.O.R.G.E., Rosso, P.E.D.R.O., Collins, A.M., James, L.S. and Blanc, W.A., 1985. Fetal lung hypoplasia associated with maternal smoking: a morphometric analysis. Pediatric research, 19(4), pp.408-412.

Cook, D.G., Strachan, D.P. and Carey, I.M., 1998. Health effects of passive smoking. 9. Parental smoking and spirometric indices in children Cope, G.F. and Heatley, R.V., 1992.

Creswell, J.W., Hanson, W.E., Clark Plano, V.L. and Morales, A., 2007. Qualitative research designs: Selection and implementation. The counseling psychologist, 35(2), pp.236-264. 50 | P a g e Cunningham, J., Dockery, D.W. and Speizer, F.E., 1994. Maternal smoking during pregnancy as a predictor of lung function in children. American journal of epidemiology, 139(12), pp.1139-1152. Hanrahan, J.P., Tager, I.B., Segal, M.R., Tosteson, T.D., Castile, R.G., Van Vunakis, H., Weiss, S.T. and Speizer, F.E., 1992. The effect of maternal smoking during pregnancy on early infant lung function. American Review of Respiratory Disease, 145(5), pp.1129-1135.

Stroud, L.R., Paster, R.L., Goodwin, M.S., Shenassa, E., Buka, S., Niaura, R., Rosenblith, J.F. and Lipsitt, L.P., 2009. Maternal smoking during pregnancy and neonatal behavior: a large-scale community study. Pediatrics, 123(5), pp.e842-e848.

THE EFFECT OF LIFESTYLE CHANGES ON BLOOD PRESSURE CONTROL AMONG HYPERTENSIVE PATIENTS

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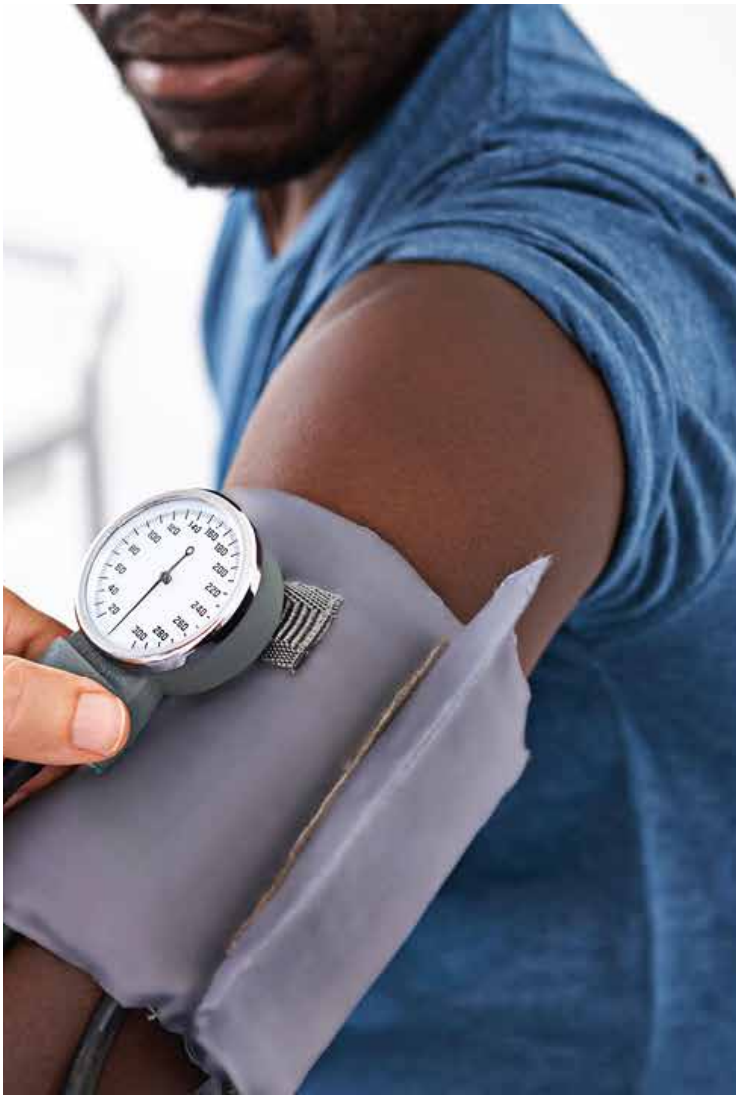
Abstract |

Much evidence has emerged on the significance of lifestyle modification of hypertension control, its efficacy and safety as management. However, fewer studies exist that put an emphasis on healthy lifestyle choices (balanced diet, increased physical activity) and the vital role they have on hypertension control in Botswana. The purpose of this study was to give a detailed review on The Effects of Lifestyle Changes on Blood Pressure Control among Hypertensive Patients. . A computerized search was done in four different data bases published, Google, PubMed, Medline and Embase on the 20th June 2019. A thorough step by step guidance of the PRISMA checklist was followed. Research articles that investigated the effectiveness of lifestyle modifications on hypertensive patients were appropriate. The practicality of the selected studies was analysed using PICOS checklist. To conclude on the consistency of the selected studies, the current review assessed; 1) description of the measures implemented, 2) results of the measures implemented and 3) population characteristics. 5 studies were found eligible, overall; low salt intake, reduced alcohol intake, smoking cessation, BMI control and stress management could be summarized to have an effect on hypertension control, however most of these measures have a higher impact on hypertension reduction when implemented together. Maintaining a normal BMI alone showed a significantly higher decrement on hypertension.

Key words | Effects, Hypertension, Non-Communicable Diseases.



Background

Lifestyle modification, formerly called non-pharmacological therapy, has a vital role in hypertensive as well as non-hypertensive individuals. In hypertensive individuals, lifestyle modifications can be implemented as initial treatment before the start of drug therapy and as an adjunct to medication in persons already on pharmacological treatment (Stamler, J., et al 1989). In hypertensive patients with medication-controlled BP, these therapies can facilitate drug step-down and drug withdrawal in highly motivated individuals who achieve and sustain lifestyle changes (Whelton, P.K., et al 1998). In non-hypertensive, lifestyle modifications have the potential to prevent hypertension, and more broadly to reduce BP and thereby lower the risk of BP-related clinical complications in whole populations (Lawrence J. Appel P., et al 2003).

Indeed, even an apparently small reduction in BP, if applied to an entire population, could have an enormous beneficial effect on cardiovascular events. For instance, a 3-mmHg reduction in systolic BP should lead to an 8% reduction in stroke mortality and a 5% reduction in mortality from coronary heart disease (WHO 2003). Modifiable risk factors such as healthy lifestyle would indeed, if followed the proper way, reduce the incidence or progression of one developing hypertension as most researches indicate poor lifestyle choices such as diet

being the most leading cause of the disease,(Christiana Nsiah-Asamoah., et al 2017) Found that high intake of sodium is common in most African countries where salt is used to preserve food or to make it tastier. They further reported that nutritional factors may explain 30-75% cases of hypertension and therefore recent efforts to reduce the prevalence of hypertension have focused on lifestyle modification strategies, specifically diet. This further supports the purpose of this systematic review, a blueprint to a large scale nationwide research. (Hien et al, 2018) Also found that the impact of hypertension is influenced by a wide variety of risk factors such as tobacco use, excessive alcohol consumption, unhealthy diet, physical inactivity, overweight and obesity, elevated blood glucose and abnormal blood lipids. All aspects of lifestyle basically emphasizing a change in the listed factors would significantly reduce risk factors in the general population, primary prevention in the high risk groups and be an intensive method of management in secondary prevention.

EPIDEMIOLOGICAL DATA OF RESEARCH TOPIC

Worldwide, elevated blood pressure is approximated to cause 7.5 million deaths, about 12.8% of the total of all deaths. This accounts for 57 million disability adjusted life years (DALYS) or 3.7% of total DALYS (WHO 2019). Elevated blood pressure is a main risk factor for coronary heart disease and ischemic as well as haemorrhagic stroke. Blood pressure levels have been shown to be positively and continuously related to the risk for stroke and coronary heart disease. In some age groups, the risk of cardiovascular disease doubles for each raise of 20/10 mmHg of blood pressure, starting as low as 115/75 mmHg.(WHO 2019) further states, In addition to coronary heart diseases and stroke, impediments of raised blood pressure include heart failure, peripheral vascular disease, renal impairment, retinal hemorrhage and visual loss. Treating systolic blood pressure and diastolic blood pressure until they are less than 140/90 mmHg is associated with a reduction in cardiovascular complications.

The preventive actions concern habits and lifestyle monitoring. Two important low (or no)cost preventive measures are: first, a decrease in dietary salt consumption, (Douglas GJ., et al 2003) and second, a greater awareness of the implications of obesity.(Bovet P., et al 2002) There is good proof that a decrease in salt intake reduces blood pressure and that black people are more sensitive than white people in this regard. (Cappucio FP .,et al 2000) Other measures, such as increased physical exercise,(Oppie-Lh et al 2005) decreased obesity, cessation of smoking and limited alcohol consumption,(Appel LI ..,et al 2003) are all as important in black subjects as in whites in the prevention and control of hypertension.

RESEARCH AIM

To assess the effects of lifestyle changes on blood pressure control among hypertensive patients.

OBJECTIVE

1. To identify lifestyle modifications used to control blood pressure among hypertensive patients.
2.2. To determine the efficacy of lifestyle modification as a mode of intervention in diagnosed hypertensive patients.

METHODOLOGY

In order to answer the aims and objectives of the research topic, secondary data was systematically reviewed. The databases used for attaining the information included PubMed, Google scholar. The utilization of the multiple databases presented the opportunity to gain accurate and reliable information that signified the primary aspects of the study. Also, the research study used the PRISMA tool for screening the research resources.

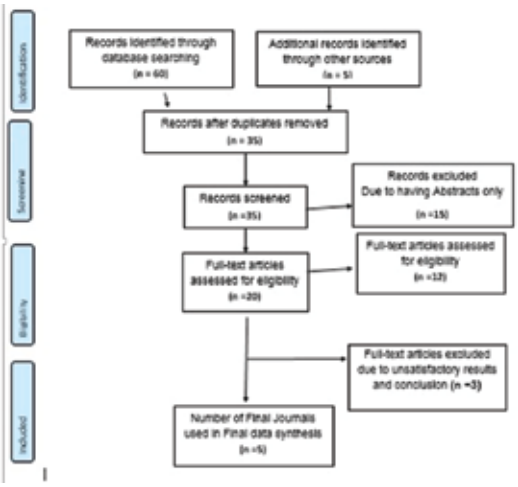
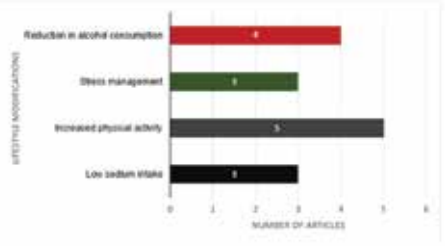


Figure 1.0; PRISMA CHART FLOW

RESULTS

Identified studies were uploaded into endnote (Thomas Reuters) and duplicates were removed. 2 reviewers vetted through the study based on the topic and abstracts that met the inclusion criteria. Studies selected after the first screening were further screened through a detailed full text browsing, to further exclude studies that had some of the exclusion criteria. Out of 65 studies identified, 30 were excluded due to duplication. Out of the 35 selected, 15 were excluded due to having abstracts only. Out of the 8 selected, 3 were further excluded due to unsatisfactory results and conclusion. Only 5 were finally used.

Fig 1.2| KEY RESULTS AND DISCUSSION



DATA ANALYSIS AND INTERPRETATION

Salt intake reduction

For people with high blood pressure, salt restriction seems to have important value in decreasing blood pressure. Midgley.., et al 1996) found that in trials with hypertensive subjects, the adjusted reduction in blood pressure allied with a decrease in daily sodium consumption of 100 mmol was 3.7 mm Hg for systolic blood pressure and 0.9 mm Hg for diastolic blood pressure. This effect was more pronounced in people older than 44 years of age. (Fodor, J.G., et al 1999)Salt reduction has been suggested as a possible adjunct to pharmacologic treatment to improve blood pressure control. Several studies have explored this issue and found that, for hypertensive patients who are receiving antihypertensive medication, salt restriction provides additional benefits in terms of blood pressure control.(Bompiani,G.D.,et al 1988)

Stress management

There is no evidence that stress management averts hypertension, however there is some proof that stress management can reduce blood pressure in hypertensive patients (Spence, J.D., et al 1999). The key to this approach is tailoring the intervention to the patient's needs. Individualized Strategies in terms of cognitive behavioral stress therapy were reviewed, such as increasing attentiveness to stressors and stress responses, re-evaluating negative life events, communications skills training (e.g., marital communication and assertiveness training), improvement of problem-solving skills, controlling of negative emotions (e.g., anger and anxiety) and methods for lowering sympathetic stimulation(e.g., relaxation exercises).(Spence, et al, 1999). . In one meta-analysis (Eisenberg DM, et al, 1993) the change in blood pressure with such interventions was –1.5 to +2.9/–0.8 to+1.2 mm Hg, whereas the change was –9/–6 mm Hg in a second meta-analysis.(Linden W, et al, 1994). . Multicomponent individualized cognitive behavioural interventions decrease blood pressure to a greater degree and over a longer period of time. Linden and Chambers performed a metaanalysis and found that blood pressure was reduced by 9.7/7.2 mm Hg with multicomponent relaxation techniques (Linden W, et al, 1994).

Increased physical activity was associated with successful blood pressure control. In addition, increased BMI was negatively associated with adequate blood pressure control. The total rate of successful blood pressure control was 84.4% (64.6% female and 35.4% male)(MyungHwa Yang, et al 2917). Among the baseline characteristics, age, sex, salt intake, and family.

An increased level of physical activity can lower BP, independent of related changes in weight. A recent meta-analysis of 27 randomized trials recognised a 4 mmHg net decrease in systolic BP among individuals allocated to an aerobic exercise intervention (Whelton, S.P., et al 2002). However, the magnitude of the change in blood pressure seemed to be independent of the exercise intensity. Furthermore to a direct positive effect on BP, increased physical activity also lowers BP by enabling initial weight loss and by supporting maintenance of weight loss, once achieved. In aggregate, these findings support the recommendation of the US Surgeon General that persons exercise 30 min or more most, if not all, days of the week (Appel, L.J., et al 2003). Increased physical activity was associated with successful blood pressure control.In addition, increased BMI was negatively associated with adequate blood pressure control. The total rate of successful blood pressure control was 84.4% (64.6% female and 35.4% male)(MyungHwa Yang, et al 2917). Among the baseline characteristics, age, sex, salt intake, and family.

Reduction in alcohol consumption

A decrease in alcohol intake among heavy drinkers significantly reduces systolic and diastolic BP. Furthermore, suggests that alcohol reduction should be recommended as a vital element in lifestyle modification for the prevention and treatment of hypertension among heavy drinkers. (Xin, X., et al 2001) Data from overviews of observational studies and randomized trials recommend that a 2-mm Hg reduction in diastolic BP would be expected to result in a 17% decrease in the prevalence of hypertension, a 6% reduction in the risk of coronary heart disease, and a 15% reduction in the risk of stroke and transient ischemic attacks.(Cook, N.R., et al 1995). This further supports that alcohol reduction is one of the key modifiable factors in managing hypertension.

CONCLUSION

Most reviewed articles emphasized on the following lifestyle modifications as key to reducing/controlling hypertension; a reduction in alcohol intake, low sodium intake diet, stress management and an increase in physical activity. Among them, an increase in physical activity showed to have a greater drop in blood pressure because it also aims at reducing other factors that contribute to an increased blood pressure like obesity and a higher than normal BMI. All of the mentioned lifestyle changes showed a significant reduction in blood pressure with` a daily sodium consumption of 100 mmol reducing Bp by 3.7 mm Hg for systolic blood pressure and 0.9 mm Hg for diastolic blood pressure, most studies indicated a 2mmHg reduction in both systolic and diastolic blood pressure for alcohol reduction. A significant reduction of 4mmHg for both systolic and diastolic for increased physical activity and a reduction of 1.5 to +2.9/–0.8 to+1.2 mm Hg for stress management.

Lifestyle modification is a suitable primary therapy for patients with mild hypertension (i.e., blood pressure of 140-159 mmHg systolic and/or 90-99 mmHg diastolic.)

and is a suitable adjunct to pharmacologic treatment. It prevents an increase in blood pressure and the development of hypertension in people at risk. In hypertensive patients with medication-controlled BP, these therapies can facilitate drug step-down and drug withdrawal in highly motivated individuals who achieve and sustain lifestyle changes, this in turn shows great benefit to one's health since it hinders drug dependence. It would also be financially beneficial to the nation at large since money spent on buying anti-hypertensive drugs would in theory be reduced.

Although each factor reduces BP at a modest rate, the combined effects can be vitally significant. These effects however require health care practitioners to prescribe them to patients in a tailored manner considering which lifestyle modification best suits a particular individual, for example, an obese hypertensive patient would greatly benefit from weight loss compared to a leaner hypertensive individual. Even a small reduction in BP has a major beneficial effect on the occurrence of hypertension. In summary, a combination of increased physical activity, moderation in alcohol intake, a consumption of a diet that is lower in sodium content and high in fruits and vegetables is the best approach for preventing/controlling high blood pressure in the general population and in high risk groups and can be sustained over a long period of time, (more than 3 years).

LIMITATIONS

Limitations in this systematic review are as follows; the number of articles and studies found and used to gather information were few, thus restricting the accuracy of the results found. Due to lack of time and resources the findings of this systematic review should not be generalized in Botswana because this was the first review. The most serious limitation of this systematic review is the outcome measures that have been used.. Studies reviewed risked bias as subjects selected in the reviewed studies were mostly white, educated men who adhered to the interventions and thus some of this studies didn't represent well the entire population, and in some studies the endpoints were retrospective. As such some lifestyle modifications might not be as efficacious when applied to other races. Limitations faced on outcomes was risk of bias since all articles reviewed and found were only addressing the positivity of lifestyle changes and negatives that may arise were neglected. There was incomplete retrieval of identified research.

RECOMMENDATIONS

In light of the world wide BP related diseases and the positive effects of lifestyle modification on hypertension control, the main focus for health care providers and fellow researchers should be to come up with strategies that reach and maintain lifestyle changes. The general population should recognize the benefits of reducing excessive salt intake, moderate alcohol intake, an increase in physical activity, stress management and a low fat diet high in fruits and vegetables as a move toward a healthier lifestyle. Health care professionals and the general public should be given additional education on lifestyle modifications. Enhanced support for patients attempting to change their lifestyle and establishment of policies that make complying with recommendations less of a burden. A standardised national protocol for lifestyle modifications should be designed aimed at both high risk patients and patients already on medication. Botswana has a free health care policy, and hypertension control requires a lifetime supply of antihypertensive drugs, as such the country should look into lifestyle modification as a better alternative which would help save millions of pulas spent on antihypertensive drugs. This systematic review should be used as a foundation for nationwide research to be conducted to further support this information and to get an insight of how much of a burden hypertension is and how can lifestyle modification help alleviate the situation.

REFERENCES

REFERENCES

Akinkugbe, O.O. and Akinyanju, O.O., 1997. Final Report-national Survey on non-communicable diseases in Nigeria. Lagos: Federal Ministry of Health, pp.65-68.

Akinyi, H., Oti, S., Olajide, A., Agyemang, C., Aboderin, I. and Kyobutungi, C., 2013. Status report on hypertension in Africa--consultative review for the 6th Session of the African Union Conference of Ministers of Health on NCD's. The Pan African medical journal, 16, pp.38-38.

Arnold, M., Pandeya, N., Byrnes, G., Renehan, A.G., Stevens, G.A., Ezzati, M., Ferlay, J., Miranda, J.J., Romieu, I., Dikshit, R. and Forman, D., 2015. Global burden of cancer attributable to high body-mass index in 2012: a population-based study. The Lancet Oncology, 16(1), pp.36-46.

Appel LJ, Champagne CM, Harsha DW, Cooper LS, Obarzanek E, Elmer PJ et al. Effects of comprehensive lifestyle modification on blood pressure control: main results of the PREMIER clinical trial. JAMA 2003; 289(16): 2083–2093

Arkwright, P.D., Beilin, L.J., Rouse, I., Armstrong, B.K. and Vandongen, R., 1982. Effects of alcohol use and other aspects of lifestyle on blood pressure levels and prevalence of hypertension in a working population. Circulation, 66(1), pp.60-66.

Bloomfield, R.O.B.E.R.T., Young, L.D. and Graves, J.O.H.N., 1993. Racial differences in perceptions concerning hypertension and its consequences. Southern medical journal, 86(7), pp.767-770.

Bompiani, G.D., Cerasola, G., Morici, M.L., Condorelli, M., Trimarco, B., De, N.L., Leonetti, G., Sampieri, L., Cuspidi, C. and Cottone, S., 1988. Effects of moderate low sodium/high potassium diet on essential hypertension: results of a comparative study. International journal of clinical pharmacology, therapy, and toxicology, 26(3), pp.1

Bovet P, Ross AG, Gervasoni JP, Mkamba M, Mtasiwa DM, Lengeler C et al. Distribution of blood pressure, body mass index and smoking habits in the urban population of Dar es Salaam, Tanzania, and associations with socioeconomic status. Int J Epidemiol 2002; 31(1): 240–247

Bruno, R.M., Pucci, G., Rosticci, M., Guarino, L., Guglielmo, C., Rosei, C.A., Monticone, S., Giavarini, A., Lonati, C., Torlasco, C. and Fedecostante, M., 2016. Association between lifestyle and systemic arterial hypertension in young adults: a national, survey-based, cross-sectional study. High Blood Pressure & Cardiovascular Prevention, 23(1), pp.31-40.

Cappuccio FP, Plange-Rhule J, Phillips RO, Eastwood JB. Prevention of hypertension and stroke in Africa. Lancet 2000; 356(9230): 677–67829-132.

Chalmers, J.O.H.N., MacMahon, S., Mancia, G., Whitworth, J., Beilin, L., Hansson, L., Neal, B., Rodgers, A., Ni, C.M. and Clark, T., 1999. 1999 World Health Organization-International Society of Hypertension Guidelines for the management of hypertension. Guidelines sub-committee of the World Health Organization. Clinical and experimental hypertension (New York, NY: 1993), 21(5-6), pp.1009-1060.

Chobanian, A.V., Bakris, G.L., Black, H.R., Cushman, W.C., Green, L.A., Izzo Jr, J.L., Jones, D.W., Materson, B.J., Oparil, S., Wright Jr, J.T. and Roccella, E.J., 2003. The seventh report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure: the JNC 7 report. Jama, 289(19), pp.2560-2571.

Chobanian, A.V., Bakris, G.L., Black, H.R., Cushman, W.C., Green, L.A., Izzo Jr, J.L., Jones, D.W., Materson, B.J., Oparil, S., Wright Jr, J.T. and Roccella, E.J., 2003. The seventh report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure: the JNC 7 report. Jama, 289(19), pp.2560-2571.

Hagberg, J.M., Park, J.J. and Brown, M.D., 2000. The role of exercise training in the treatment of hypertension. Sports medicine, 30(3), pp.193-206.

Cook, N.R., Cohen, J., Hebert, P.R., Taylor, J.O. and Hennekens, C.H., 1995. Implications of small reductions in diastolic blood pressure for primary prevention. Archives of Internal Medicine, 155(7), pp.701-709.

Douglas JG, Bakris GL, Epstein M, Ferdinand KC, Ferrario C, Flack JM et al. Management of high blood pressure in African Americans: consensus statement of the Hypertension in African Americans Working Group of the International Society on Hypertension in Blacks. Arch Intern Med 2003; 163(5): 525–541.

Feigin, V.L., Lawes, C.M. and Bennett, D.A., 2008. Worldwide stroke incidence and early case fatality reported in 56 population-based studies. A systematic review, 2009, p.8.

Fodor, J.G., Whitmore, B., Leenen, F. and Larochelle, P., 1999. Lifestyle modifications to prevent and control hypertension. 5. Recommendations on dietary salt. Canadian Hypertension Society, Canadian Coalition for High Blood Pressure Prevention and
Control, Laboratory Centre for Disease Control at Health Canada, Heart and Stroke Foundation of Canada. CMAJ: Canadian Medical Association Journal, 160(9), p.S29.

Goto, C., Higashi, Y., Kimura, M., Noma, K., Hara, K., Nakagawa, K., Kawamura, M., Chayama, K., Yoshizumi, M. and Nara, I., 2003. Effect of different intensities of exercise on endothelium-dependent vasodilation in humans: role of endothelium-dependent nitric oxide and oxidative stress. Circulation, 108(5), pp.530-535.

Grassi, G., Cifkova, R., Laurent, S., Narkiewicz, K., Redon, J., Farsang, C., Viigimaa, M., Erdine, S., Brambilla, G., Bombelli, M. and Dell'Oro, R., 2010. Blood pressure control and cardiovascular risk profile in hypertensive patients from central and eastern European countries: results of the BP-CARE study. European heart journal, 32(2), pp.218-225.

Hien, H. A., 2018. Prevalence, awareness, treatment and control of hypertension and its risk factors in central vietnam. international journal of hypertension.

Ibrahim, M.M. and Damasceno, A., 2012. Hypertension in developing countries. The Lancet, 380(9841), pp.611-619.

Kadiri S, Walker O, Salako BL, Akinkugbe OO. Blood pressure, hypertension and correlates in urbanized workers in Ibadan, Nigeria – a revisit. J Hum Hypertens 1999;13:23–7.

Kearney, P.M., Whelton, M., Reynolds, K., Muntner, P., Whelton, P.K. and He, J., 2005. Global burden of hypertension: analysis of worldwide data. The lancet, 365(9455), pp.217-223.

Klatsky, A.L., Friedman, G.D., Siegelaub, A.B. and Gérard, M.J., 1977. Alcohol consumption and blood pressure: Kaiser-Permanente multiphasic health examination data. New England Journal of Medicine, 296(21), pp.1194-1200.

Kohlbacher, F., 2006. The use of qualitative content analysis in case study research. In Forum Qualitative Sozialforschung/Forum: Qualitative Social Research (Vol. 7, No. 1, pp. 1-30). Institut für Qualitative Forschung.

Lieber, C.S., 1995. Medical disorders of alcoholism. New England Journal of Medicine, 333(16), pp.1058-

MacMahon, S., Peto, R., Collins, R., Godwin, J., Cutler, J., Sorlie, P., Abbott, R., Neaton, J., Dyer, A. and Stamler, J., 1990. Blood pressure, stroke, and coronary heart disease: part 1, prolonged differences in blood pressure: prospective observational studies corrected for the regression dilution bias. The Lancet, 335(8692), pp.765-774.

Midgley, J.P., Matthew, A.G., Greenwood, C.M.T. and Logan, A.G., 1996. Effect of reduced dietary sodium on blood pressure: a meta-analysis of randomized controlled trials. Jama, 275(20), pp.1590-1597.

Mills, K.T., Bundy, J.D., Kelly, T.N., Reed, J.E., Kearney, P.M., Reynolds, K., Chen, J. and He, J., 2016. Global disparities of hypertension prevalence and control: a systematic analysis of population-based studies from 90 countries. Circulation, 134(6), pp.441-450.

Myung Hwan Yhang, e. a., 2017. The Effect of Lifestyle Changes on Blood Pressure
Control Among Hypertensive Patients. Lifestyle Changes and Blood Pressure control.

Neaton, J.D., Grimm, R.H., Prineas, R.J., Stamler, J., Grandits, G.A., Elmer, P.J., Cutler, J.A., Flack, J.M., Schoenberger, J.A., McDonald, R. and Lewis, C.E., 1993.

Treatment of mild hypertension study: final results. Jama, 270(6), pp.713-724.

Nsiah-Asamoah, C., Setorglo, J. and Mie, J.B., 2017. Nutritional Counseling for Hypertensive Patients: Have Final-Year Nursing Students Learnt Enough to Be Able to Offer Advice to Such Patients?. Journal of Biomedical Education, 2017.

Opie LH, Seedat YK. Hypertension in sub-Saharan African populations. Circulation 2005; 112(23): 3562–3568.

Parker, M., Puddey, I.B., Beilin, L.J. and Vandongen, R., 1990. Two-way factorial study of alcohol and salt restriction in treated hypertensive men. Hypertension, 16(4), pp.398-406.

Pickering, T., 1996. Recommendations for the use of home (self) and ambulatory blood pressure monitoring. American Journal of Hypertension, 9(1), pp.1-11.

Potter, J.F. and Beevers, D.G., 1984. Pressor effect of alcohol in hypertension. The Lancet, 323(8369), pp.119-122.

Poulter, N.R., Khaw, K.T., Hopwood, B.E.C., Mugambi, M., Peart, W.S., Rose, G. and Sever, P.S., 1990. The Kenyan Luo migration study: observations on the initiation of a rise in blood pressure. Bmj, 300(6730), pp.967-972.

Ryan, T.J., Anderson, J.L., Antman, E.M., Braniff, B.A., Brooks, N.H., Califf, R.M., Hillis, L.D., Hiratzka, L.F., Rapaport, E., Riegel, B.J. and Russell, R.O., 1996. ACC/AHA guidelines for the management of patients with acute myocardial infarction: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee on Management of Acute Myocardial Infarction). Journal of the American College of Cardiology, 28(5), pp.1328-1419.

Schnall, P.L., Schwartz, J.E., Landsbergis, P.A., Warren, K. and Pickering, T.G., 1992. Relation between job strain, alcohol, and ambulatory blood pressure. Hypertension, 19(5), pp.488-494.

Trilling, J.S. and Froom, J., 2000. The urgent need to improve hypertension care. Archives of Family Medicine, 9(9), pp.794-801.

Whelton, S.P., Chin, A., Xin, X. and He, J., 2002. Effect of aerobic exercise on blood pressure: a meta-analysis of randomized, controlled trials. In Database of Abstracts of Reviews of Effects (DARE): Quality-assessed Reviews [Internet]. Centre for Reviews and Dissemination (UK).

Xin, X., He, J., Frontini, M.G., Ogden, L.G., Motsamai, O.I. and Whelton, P.K., 2001. Effects of alcohol reduction on blood pressure: a meta-analysis of randomized controlled trials. Hypertension, 38(5), pp.1112-1117.1

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FACTORS INFLUENCING RURAL HEALTH CARE PROFESSIONALS' ACCESS TO CONTINUING PROFESSIONAL EDUCATION IN HEALTH CARE FACILITIES.

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Abstract|

Health education in rural communities is one of the main ways in which developing countries are addressing prevalent health issues in many rural villages' communities. Health workers acts as proxies through which health education information is spread in their communities. In this systematic review we discuss important principles to consider when designing solutions for creating and distributing digital health content in rural communities, based on previous work in the area of health education.
It addresses factors which influence rural area professionals' access to continuous professional development programs and the benefits that comes about being involved in such activities.

Key words| Health care worker, Professional Education, Rural Healthcare Facilities.

Background

Professional development is the process by which health workers are obliged to keep updated to meet the needs of patients, the health service, and their own professional development. It includes the continuous acquisition of new knowledge, skills, and attitudes to enable competent practice. (David A. Cook., el al 2016) Continuing medical developments which include managerial, social, and personal skills and topics beyond the traditional clinical medical subjects. It acknowledges not only the wide-ranging competences needed to practice high quality medicine but also the multidisciplinary context of patient care. (Cary P., et al 2006).

This includes all activities intended to improve professional knowledge, skills, or performance. Acquiring this improvement includes studying journal articles, reading Up-to-date information, participating in a live or online course, or doing a practice audit-and improvement. It also includes learning for both clinical and non-clinical responsibilities such as teaching, research, and leadership. (David A. Cook., el al 2016).

The mind set of clinicians is developed and honed by their discipline and their experience of their patients. They master specialized scientific knowledge of particular body systems and conditions. (Merrilyn Walton., et al 2015). Today's health care professionals must function in complex and changing health care systems, continuously refresh and update their patient and healthcare problems. Preparing professionals who possess these capabilities is correspondingly complex but those working in

RESEARCH AIM

The aim of this research is to conduct a systematic review about factors that influence rural healthcare professionals' access to continuing professional development.

OBJECTIVE

1. To identify which training programmes are offered for healthcare professionals in rural areas.
2. To determine who conducts or offers training opportunities to medical professionals in rural areas.
3. To identify the benefits of regular training of healthcare professionals.

METHODOLOGY

Due to time constraints and limited financial resources the research aims and objectives were achieved via a systematic review approach. The PRISMA tool was used to evaluate information from dependable data sources such as journals, articles, pub med and Google scholar search. 60 articles were initially identified, screened using the PRISMA tool exclusion, inclusion criteria and 8 we related to the topic of interest and used for final result.

RESULTS

Identified studies were uploaded into endnote (Thomas Reuters) and duplicates were removed. 2 reviewers read through the study based on the topic and abstracts that met the inclusion criteria. Studies selected after the first screening were further screened through a detailed full text browsing, to further exclude studies that had some of the exclusion criteria. Out of 43 studies identified, 17 were excluded due to having abstracts only. Out of the 26 selected, 18 were further excluded due to unsatisfactory results and conclusion. Only 8 were finally used.

Fig 1.0 | Prisma Flow Chart

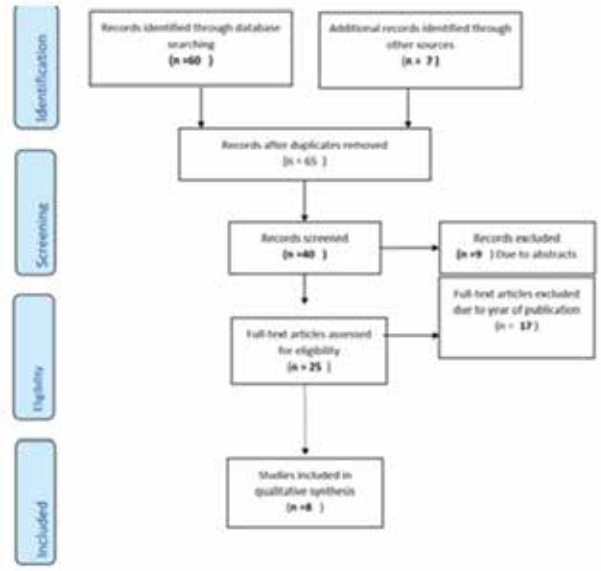
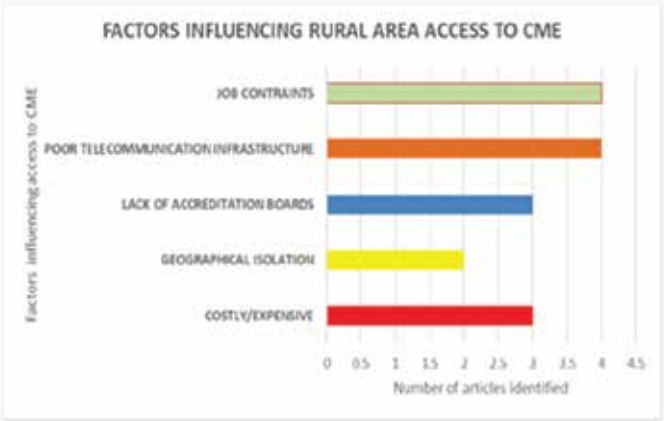


Fig 1.2| KEY RESULTS AND DISCUSSION



DATA ANALYSIS AND INTERPRETATION

COSTS

Job constraints

The misdistribution of health workers between urban and rural or remote areas is a concern in virtually all countries. In Senegal, for example, the Dakar region, which is mostly urban, has more than 60% of the country's physicians but only 23% of the total population.1 In Canada – where 99.8% of the territory is rural – 24% of the population but only 9.3% of the physicians lived in rural areas in 2006.2 About one half of the world's population lives in rural and remote areas, but this half is served by only one quarter of the world's doctors and by less than one third of the world's nurses. (Wilson N.W.,et al 2009).

Due to this uneven distribution of medical professionals, some rural health care professionals are the sole providers of health care in their communities, therefore simply cannot leave their communities to attend an educational session, or be involved in a developmental training program regardless of how beneficial it might be for their patients and their practices. Also arranging the necessary locum or replacement coverage is difficult to almost impossible due to the lesser number of medical professionals allocated to rural area health facilities. (Wilson N.W.,et al 2009

POOR TELECOMMUNICATION/ TECHNOLOGY ACCESS

Rural health care professionals must have access to continuous provisional development programs to stay aware and relevant of the rapid advances in patient care and medical practices. This places professionals in rural areas in a unenviable position of having to provide the best health care to the public while trying to use and apply a rapidly changing body of knowledge whiles having poor technological access and no good infrastructures to achieve such information. (Flexner. L ., et al 2013) Improved access to continuous professional education for rural health professionals is necessary to foster confidence, reduce professional isolation and promote competent standards of practice.

Many rural health care professional have to solemn depend on their personal gadgets to be able to access online medical materials, partake on online training programmes with no support from management. .(Aust. J., 2006) The lack of adequate access to technology identified as a key barrier, specifically a lack of Internet access and videoconferencing capabilities as most of material which influence self-motivated learning area based through telemedicine.

LACK OF FORMAL ACCREDITATION BOARDS

Literature indicate health professionals best interest regarding continuous development programs as they indicate it as a solution to the ever diversifying health framework. In regards to this medical professionals indicated the need for official recognition or accreditation of development programs that they are involved in their country of practice.(Alan L. Hanson et al 2007) Many pointed other that there are no boards responsible for conducting development trainings or accrediting such activities even when an individual took an effort to be involved in training activities. They strongly and uniformly agreed that point-of-care learning is vital to effective patient care and that continuous medical development should occur in the context of their clinical practice. (Wilson N.W.,et al 2009).

GEOGRAPHIC DISTANCE

Medical rural facilities are many of times an isolated and distanced larger tertiary institution, which is made in order to try and cover a large scope of area to bring services to all people. This distance often contributes to the cost of attending selected continuous professional development activities, and adds more to time spent away from work hence the requirement for professionals to take unpaid leaves to attend such activities.(Aust. J., 2006) Gaining access to development activities often is a challenge due to such factors.

COSTLY

The education of health care professionals is expensive as compared to other departments. In regards to continuous development programs the is little financial strategies in place to help unburden health workers from having to cover the cost of course, materials, accommodation and all other necessary components to take part in development training programs. (Kieran. W., et al 2014)

CONCLUSION

Literature indicated that continuous professional development is a great initiative globally to achieving a sustainable, reliable and stable health frame with the best patient care delivery globally. Despite this being of such importance not any country has fully achieved the objective of ensuring that all health care professionals are involved in the development

Training programs, especially those in rural areas being of great concern. Many factors are in play, major identified ones being geographic isolation or distance, poor technological and telecommunications infrastructure, lack of official accreditation boards and continuous medical programs being expensive or costly were identified as key barriers to delivery and access development training programs in rural areas. Financial factors, such as funding to support travel or cost of attendance, identified as major challenges.

The other aim of this research was to identify if conduction of continuous professional development programs is beneficial to medical professionals in rural areas. Articles which showed documented information on CME conducted on different medical professionals throughout their professional life, and the impact or the change they achieved through such training were reviewed. Many articles reviewed showed that continues education is one of the important aspect in one's career to ensure accumulation of new skills, knowledge and practices. The main concern in the entire world is to provide safe medicine which can only be possible if medical professionals are competent, trustworthy, skillful hence medical professionals need to learn the necessary information to ensure safe patient care.

REFERENCES

Austin, Z., Marini, A., Glover, N.M. and Croteau, D., 2005. Continuous professional development: a qualitative study of pharmacists' attitudes, behaviors, and preferences in Ontario, Canada. American Journal of Pharmaceutical Education
Babenko,M,Y., Andrusyszyn, M.A and Goldenberg, D., 2004. Effects of computer based clinical conferencing on nursing students' self-efficacy. Journal of nursing education

Bell, H.M., Maguire, T.A., Adair, C.G. and McGartland, L.F., 2001. Perceptions of CPD within the pharmacy profession. International Journal of Pharmacy Practice..

Bruskiewitz, R.H., DeMuth JE. Availability and acceptability of distance-learning delivery systems for continuing pharmaceutical education.
Canadian Patient Safety Institute. The safety competencies. 1st edn. Toronto:
Canadian Patient Safety Institute, 2009.
Canadian Patient Safety Institute. Patient safety education program-Canada. Edmonton, 2013. http://www. patientsafetyinstitute.ca/english/education/ patientsafetyeducationproject/pages/default.aspx (accessed 14 May 2013). Check J, and Rchutt, R.K., 2011.Research methods in education. Sage Publications

Cook D.A., Blachman MJ, West CP, Wittich CM. Physician attitudes about maintenance of certification: A cross-specialty national survey. Mayo Clin Proc. 2016;91:1336–1345.

Davis,D.,Taylor-Vaisey, A. 1997:Translating guidelines into practice: a systematic review of theoretic concepts, practical experience and research evidence in the adoption of clinical practice guidelines. CMAJ.;157. p408-416.
Dornan,T., Carroll, C. and Parboosingh, J., 2002. An electronic learning portfolio for reflective continuing professional development. Medical education, 36(8), pp.767769.

Dopp, A.L., Moulton, J.R., Rouse, M.J. and Trewet, C.B., 2010. A five-state continuing professional development pilot program for practicing pharmacists. American journal of pharmaceutical education, 74(2), p.28.

Dornan, T., Carroll, C., & Parboosingh, J. (2002). An electronic learning portfolio for reflective continuing professional development. Medical

Duke, S., & Appleton, J. (2000). The use of reflection in a palliative care programme: A qualitative study of the development of reflective skills over an academic year. Journal of Advanced Nursing, 32, 1557– 1568. Dornan, T., Carroll

Ferreira, F.H., and Walton, M. eds., 2005. World development report 2006: equity and development (Vol28). World Bank Publications.

Frengley ,R.W., Weller, JM., Torrie, J.2011:The effect of a simulation-based intervention on the performance of established critical care unit team. Crit Care Med.39(12). p2605–2611

Forti E,M., Martin KE, Jones RL, Herman JM. Factors influencing retention of rural Pennsylvania family physi- cians. Journal of the American Board of Family Practice .

Hull, H., Hunt, A. and Rutter, P., 2003. Community pharmacists' attitudes and approaches to the Royal Pharmaceutical Society of Great Britain continuing professional development initiatives. International Journal of Pharmacy Practice.

Hallett, C., (1997). Learning through reflection in the community: The relevance of
Scho ¨n's theories of coaching to nursing education. International Journal of Nursing Studies, 34, 103–110.

Harden, R., Grant, J., Buckley, G., & Hart, I. (1999). BEME guide no. 1: Best evidence medical education. Medical Teacher, 21, 553–562.

Hatton, N., & Smith, D. (1995). Reflection in teacher education: Towards definition and implementation. Teaching and Teacher Education, 11, 33–49.

Kilminster S, Health Workforce Australia. Clinical supervision support program-directions paper. Adelaide: Health Workforce Australia, 2011. 33,

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DRIVERS OF GLOBAL HEALTHCARE COST AND THEIR IMPACTS: A SYSTEMATIC REVIEW

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Abstract|

Global health care expenditures are anticipated to continue to rise as spending is projected to increase at an annual rate of 5.4 percent between 2017-2022, from USD $7.724 trillion to USD $10.059 trillion. According to the Global health watch report 2019, it stated that spending on global health will continue to rise impacting developing nations more negatively. With poor global health care investment by nations, morbidity and mortality rates from diseases such as TB and HIV as well as other preventable diseases will no longer be managed due to shortages of funds and essential drugs causing more death leading to a declined population and economy.

The expected increasing in global health has raised many questions to what is driving this significant increase in healthcare cost. The aim of these research was to find out the global health care cost of different regions, the drivers of global health care and their impacts to various countries.

Key words| Global health care, Cost, Impacts, Driving Factors

Background

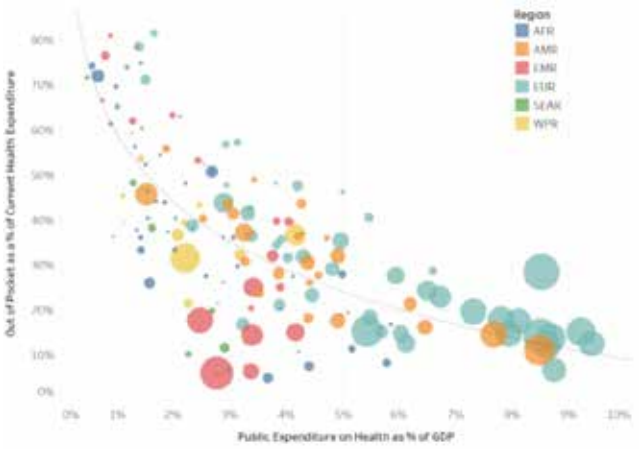
Global health expenditure is increasing worldwide, and the rate is most rapid in low- and middle-income countries where growth in all forms of spending especially in public, private and benefactor aid is now averaging 6% annually as compared to 4% in high-income countries, according to a World Health Organization report (WHO report 2018).

This data is supported and in agreement with findings from Health Policy .In evolving countries, more attention is needed to ranking health in national budgets and to better take advantage of economic growth to increase health spending as countries transition from external aid (Zhang, P., et al 2010). Less than 40% of primary health care costs are funded by government or other domestic public sources in most developing countries, meaning that either donors or users have to pay out of pocket for many of the most basic health services essential to prevention and treatment of diseases, such as vaccines or maternal and new-born care (Martin, G., et al 2012). Inpatient and outpatient therapeutic care and medicines also account for 70% of total global health spending. (Kaboli, P.J., et al 2006).

Developing countries face challenges particularly in building up and expanding health systems in an organized way that can help them get new sources of funds. This hinders increase in donor aid and puts more burden on the government as the main source of funds thus increasing the fraction of money used in healthcare. (Health policy Watch report 2019).

Impact of Personalized Medicine on Health Care Cost

Figure 1SUMMARY OF GLOBAL HEALTH CARE COST



The development of personalized medication, exponential technology, has led to better healthcare especially in developed countries for treatment of disease especially those that seemed impossible to treat back in the days. This comes at a very high cost which increase the percentage of expenditure in health thus making more to be spend in healthcare. Personalized medicine is a problem in developing countries where monetary fund is troublesome to get.

Some Important features of global health care cost

Comparing with late years, health care spending in 2019 will probably be driven by the common components of aging and growing populations, creating market expansions, clinical and innovation advances, and rising work costs (Bodenheimer, T., 2005).In addition, the pattern toward all healthcare systems is expected to continue, with more nations changing their public health system to diminish out-of-pocket (OOP) costs. (Strandberg,L R.,et al 2015)

Burden of Health Care Cost in Europe; a review of the UK'S NHS

The United Kingdom uses the national health care model system where cost of citizens health spending is covered by the government. This provides universal and equal care to individual citizens where disparity between the rich and poor is minimized. This also detrimental effects on the nation's health care cost as the government is the sole provider thus increasing the health GDP .

Health Care Cost a review of Australia

A study by Palmer, G.R. and Short, S.D., 2000 revealed that in Australia, there is a decrease in the number of people who use medical aids. These is seen as a challenge especially in hospitals and insurance companies as there is an increase in cost at 4 public hospitals

Australian states, for example, appear to be struggling with increasing public health care costs. Australia's federal government and state-based treasury departments are putting pressure on state-based health systems and public health networks (PHNs) to drive innovation that can lead to sustainable cost-reduction.

Statement of the Problem

Average per capita expenditure globally is US$ 1000 although half of the world's countries still spend less than US$350 per person a year, according to the Global health watch report 2019 stated that spending on global health will continue to rise impacting developing nations more negatively. The expected increase in global healthcare has raised many questions to what is driving this significant increase in healthcare cost.

Rationale

Healthcare cost are most of the times linked to the direct cost of drugs. The health care costs of drug-related problems can be both immense and avoidable. However, the research to date has been narrow in scope, focusing on the drug costs mostly and avoided to consider the wider range of possible negative factors or drivers which could also be leading to an increase in global health care cost. Scanning the data bases, it was established that there exists scant data or information addressing the key most important factors that accountable for an increase in global healthcare cost and their impacts, and more importantly, there is no research that has been conducted emerging from Botswana focusing on this research of interest. Armed with this information above, it was pertinent to conduct this study to fill in the knowledge gap and contribute to the professional body of knowledge in order to unearth new findings that will be used to bring about shift changes in policies in relation to drivers of health care cost in Botswana as well as a global perspective.

RESEARCH AIM

The aim of the systematic review was to identify key drivers of global health care cost and analyze its impact on global health care.

OBJECTIVE

1. To identify key drivers of Global health care cost.
2. To evaluate how global health care cost impact global health care cost.

METHODOLOGY

In order to answer the aims and objectives of the research topic, secondary data was systematically reviewed. The databases used for attaining the information included PubMed, Google scholar. The utilization of the multiple databases presented the opportunity to gain accurate and reliable information that signified the primary aspects of the study. Also, the research study used the PRISMA tool for screening the research resources.

RESULTS

Identified studies were studied, different research articles and journals from reliable and credible sources like PUBMED to explore impact of global healthcare cost, to evaluate key drivers of Global health care cost and to evaluate how global health care cost impact developing nations. PRISMA flow diagram was used for analysis. The paper is purely literature based, no external ethical committee needed to review the paper. In the final compilation of data, 10 articles were reviewed.

Fig 1.0 | Prisma Flow Chart

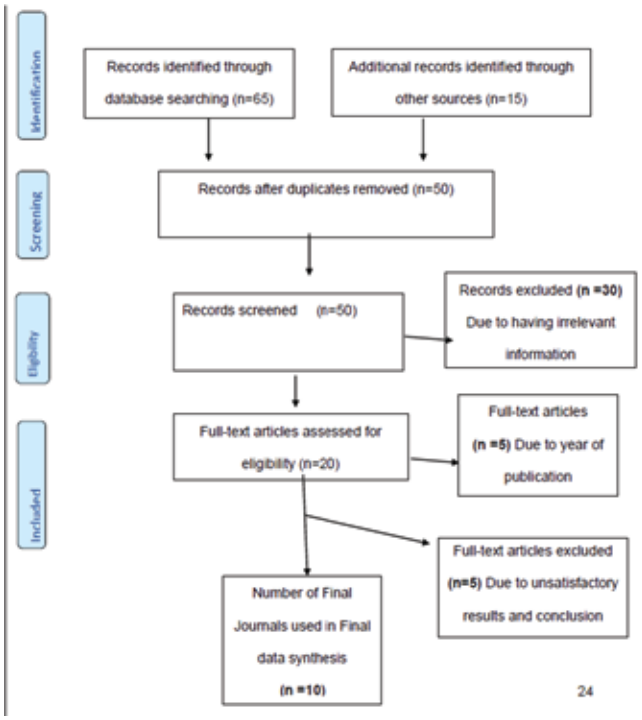
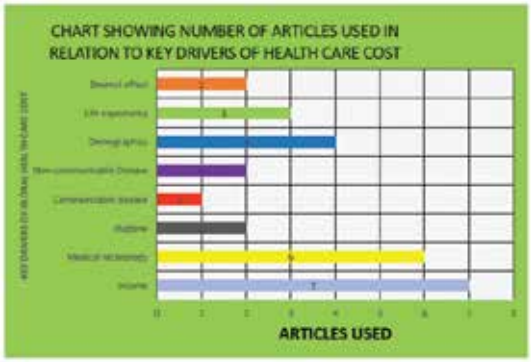


Fig 1.2| KEY RESULTS AND DISCUSSION



DATA ANALYSIS AND INTERPRETATION

1. Medical technology
2. Baumol effect
3. Income
4. Demographic Structure (Aging and population)
5. Life expectancy
6. Communicable disease
7. Non –communicable disease
8. Hygiene

Global health care cost are expected to in increase in the coming years. To look at the global healthcare expenditure, key drivers of healthcare cost were assessed as they have proven fundamental to highly increasing cost.

In discussion, Income is major key driver of health care cost of the final 10 articles used. This phenomenon is due to the growing share of health care expenditure both in household budgets and in the public government spending which is driven by the increasing awareness of the health status, growing public expectations and new technologies.

Also medical technology accounts for a high number of articles used which makes it major key driver of health care cost. Evolution in medical science and the development of new technologies strongly affect public expenditure on health care in most industrialized countries of the world. Although it is found to account for the highest share of spending growth, it is also the most difficult factor to measure. Life expectancy and demographic structure as key factors of health care cost appear in almost half of the final 10 articles reviewed. An ageing population is the most obvious factor behind increasing health care expenditure over the recent decades. Constantly growing life expectancy together with low fertility rates have resulted in the gradual development of the demographic structure of populations and is not expect to shift sharply over the next decades.

The Baumol effect, hygiene, and non-communicable disease account for around 30 percent each of the final articles reviewed as key drivers of global health care cost.
Communicable diseases is the least of the key factors influencing global health care cost according to the revised articles. Each of the drivers is further discussed in more details below.

Medical technology

Most, if not all, economists and policy analysts believe that technologic advance is a key driver of health expenditure growth. Technologic advances are generally associated with increased rather than reduced costs. As the economist point out that rapid scientific advance always raises expenditures, even as it lowers prices.(Bodenheimer, T., 2005) .Economist argue that even though technological change has accounted for the bulk of medical care cost

increases over time, the medical advances have proved to be worth far more than their costs.

Baumol effect

The macroeconomic effects on health-care encompass the Baumol effect, which is predicted by Baumol's model of unbalanced growth and the impact of collective demand on health care, which is the most undisputed driver of Health Care Expenditure. Baumol effect provides evidence that health care is rather a necessity than a luxury at the national level. (Baltagi, B. H., 2008).

Sectors that suffer from Baumol's cost diseases are characterized by slow productivity growth due to a high labor requirements. As a result, unit costs of these sectors rise inevitably if the respective wages increase with productivity growth of the progressive industries such as manufacturing. (Ahmad, N., et al 2003). Thus, according to Baumol (1993) the secular rise in health-care expenditure has been unavoidable.

Income

The consumption of health care keeps increasing. This occurrence is due to the growing share of health care expenditure both in household budgets and in the public government spending which, in turn, is driven by the increasing awareness of the health status, growing public expectations on the level of health care provision guaranteed by the state and growing availability of new technologies allowing to tackle new, previously untreatable, diseases. (Carri-on-i-Silvestre J.L., 2005). Income is also related to other key drivers of healthcare like hygiene like for example citizens in low income countries like in Africa tend to have poor health thus increasing the number on people dependent on the government for healthcare which in turn increases the GDP spending on healthcare. Countries with high income tends to have better advanced medical technology which may also cause an increase in healthcare spending (Bodenheimer T., 2005).

Demographic structure (aging and population growth)

An ageing population is the most obvious influence behind increasing health care expenditure over the recent decades. Although the use of health care depends ultimately on the health status and not the age of a person itself, elderly people use health care more often and more intensively than young cohorts. Thus, the relative increase in the proportion of the elderly population contributes to the increase in demand for and expenditure on health care (Di Matteo L., (2005) .The rapid aging of populations around the world presents an unprecedented set of challenges. These challenges are shifting disease burden, increased expenditure on health and long-term care, labor force shortages, spending of excess amount saved, and potential problems with old-age income security (Harper, S., et al 2014).

Life Expectancy

Life expectancy appears to continue to climb. It is predictable to increase from 73.5 years in 2018 to 74.4 in 2022 bringing the number of people aged over 65 globally to more than 668 million, or 11.6% of the total global population. (Feldstein, M and Horst, S. 2002.).Increasing life expectancy and years of productive life is a major achievement for health care, because increased output per worker is associated with increased real GDP per capita.

Communicable diseases

Developing countries more especially in Africa are the one who face this burden because not only because of less capital to invest in health, other drivers like poor sanitation ,low income also play role in increasing expenditure.(Stephanie Allen,.2019)
In Africa HIV/AIDS are Tuberculosis are main communicable diseases affecting healthcare cost even though there has been a recent emergence of Ebola disease in Central Africa. The quantity of AIDS-related deaths fell from 2.3 million in 2005 to an estimated 940,000 in 2017, largely due to the successful rollout of treatment. Infections from tuberculosis are falling by around 2% a year. (WHO reports 2018)

Hygiene

The fight for better Global Healthcare through better hygiene, improved living conditions and wider access to health care is making notable gains (WHO report 2007).

High pollution supported to 4.2 million deaths worldwide in 2016, with the Western Pacific area among the most exceedingly terrible influenced. This has led to more health programmes in order to fight pollution requiring monetary funds. (Hutton, G., et al 2007). In China, the push to battle contamination is a focal point of the administration's healthcare system due, in part, to its negative effect on GDP for instance, diminished laborer yield and the cost weight of illness. (Clasen, T., et al 2007). Poor sanitation has led to increase in healthcare cost in sanitation related infectious diseases.

A variety of economic impacts are linked to improved water and sanitation, which is one key contributor to poverty reduction efforts. A variety of economic impacts are linked to improved water and sanitation, which is one key contributor to poverty reduction efforts. (Pruss-Ustun, A., 2008).
Economic benefits are estimated to total US$ 38 billion annually for meeting the combined water and sanitation targets. 92% of this value is accounted for by achieving the sanitation target. The contribution to economic benefits varies between water and sanitation. For the case of sub-Saharan Africa, in achieving the water MDG target, 63% of the benefits are attributed to convenience time savings, 28% to productivity gains, and 9% to health care cost savings.(World Health Organization, 2007)

Non-communicable diseases

Non-communicable diseases (NCDs) most importantly, cancer, heart disease, and diabetes accounted for 71% of the 56.9 million deaths reported worldwide in 2016; that share increases to over 80% in the most developed markets (Kang S., et al 2012). NCDs' rise in both developed and developing markets is fuelled by urbanization, sedentary lifestyles, changing diets, and rising obesity levels (Kang S., et al 2012).

The influence of non-communicable diseases (NCDs) in populations extends beyond ill-health and mortality with large financial consequences.

Impact of increasing health care cost

Higher healthcare cost contribute sufferings in the other areas of federal budget, putting pressure on the economy as a whole. The educational and infrastructure sector of the government may suffer if more money is only directed to health. Also low income countries suffer the most in terms of catching up with recent medical advances as they cannot afford the same healthcare cost compared to high income countries (Koplan, J., 2009). A lot of African countries falls within the low and middle income range and they face a severe problem of scarcity of funds to provide quality health care services

CONCLUSION

Global healthcare cost are expected to increase significantly in years to come. The cost of healthcare is more noticeable in developing countries as compared to high developed countries with more money to spend. The cost of each healthcare programme relates to its source of funding as many countries have various source of funding which have direct effects on the country total income. Different countries use different models of health care , some the government pay for the whole coverage of health to citizens, some the cost are subsidized in the which the government pays some amount and its summed up by the citizens. In other regions private insurance or total out of pocket income is used to cover for health care.

Increasing healthcare cost contribute sufferings in the other areas of federal budget, putting pressure on the economy as a whole. The educational and infrastructure sector of the government may suffer if more money is only directed to health. Also low income countries suffer the most in terms of catching up with recent medical advances as they cannot afford the same healthcare cost compared to high income countries. A lot of African countries falls within the low and middle income range and they face a severe problem of scarcity of funds to provide quality health care services.

REFERENCES

Ahmad, N., Lequiller, F., Marianna, P., Pilat, D., Schreyer, P. and A. Wölfl (2003) Computing labour productivity growth in the OECD area: The role of measurement, OECD-STI Working Paper no. 14/03
Anon., 2018. 2018 Global health care outlook. [Online] Available at: https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Life-Sciences-Health-Care/gx-lshc-hc-outlook-2018.pdfAnon., n.d. s.l.:s.n.

Baltagi, B. H. (2008) Econometric Analysis of Panel Data, 4th ed., Chichester, UK.
Besley, T. and Coate, S. (1991), 'Public provision of private goods and the redistribution of income', American Economic Review, vol. 81, pp. 979–84.
Bodenheimer T., 2005. High and rising health care costs. Part 1: seeking an explanation. Ann Intern Med.;142:847-54

Bodenheimer, T., 2005. High and rising health care costs. Part 2: technologic innovation. Annals of internal medicine, 142(11), pp.932-937. 41
Calnan, M., Cant, S. and Gabe, J. (1993), Going Private: Why People Pay for their Health Care, Oxford: Oxford University Press.

Carrion-i-Silvestre J.L. (2005), Health care expenditure and GDP: Are they broken stationary?, Journal of Health Economics, vol. 24(5), pp. 839-854.

Di Matteo L. (2005), The macro determinants of health expenditure in the United States and Canada: assessing the impact of income, age distribution and time, Health Policy, vol. 71(1), pp. 23-42
Harper, S., 2014. Economic and social implications of aging societies. Science, 346(6209), pp.587-591. https://www.healthpolicy-watch.org accessed on 28/07/2019
Hutton, G., Haller, L. and Bartram, J., 2007. Global cost-benefit analysis of water supply and sanitation interventions. Journal of water and health, 5(4), pp.481-502.

Kaboli, P.J., Hoth, A.B., McClimon, B.J. and Schnipper, J.L., 2006. Clinical pharmacists and inpatient medical care: a systematic review. Archives of internal medicine, 166(9), pp.955-964.

Kang S, Koh ES, Vinod SK, Jalaludin B. 2012 Cost analysis of lung cancer management in South Western Sydney. J Med ImagingRadiat Oncol.;56(2):235–41. doi:10.1111/j.1754-9485.2012.02354.x.

Koplan, J., 2009. Towards a common definition of Global Health. In: Lancet Volume 373. s.l.:s.n.
Macafee DA, West J, Scholefield JH, Whynes DK., 2009; Hospital costs of colorectal cancer care. Clin Med Oncol. 3:27–37.

Mendelson, D.N. and Schwartz, W.B., 1993. The effects of aging and population growth on health care costs. Health Affairs, 12(1), pp.119-125.

Pruss-Ustun, A. and World Health Organization, 2008. Safer water, better health: costs, benefits and sustainability of
Schoeni RF, Freedman VA, Wallace RB. 2001. Persistent, consistent, widespread, and robust? Another look at recent trends in old-age disability.
WHO, Global Health Expenditure Database Report, 2014
WHO, Global Health Expenditure Database Report, 2014

World Bank. Health expenditure per capita (current US$). World Health Organization Global Health Expenditure database 2016; Available from: http://data.worldbank.org/indicator/SH.XPD.PCAP

World Health Organization, 2007. Economic and health effects of increasing coverage of low cost household drinking-water supply and sanitation interventions to countries off-track to meet MDG target 10: background document to the" Human Development Report 2006" (No. WHO/SDE/WSH/07.05). Geneva:

World Health Organization. World Health Organization, 2017. New perspectives on global health spending for universal health coverage (No. WHO/HIS/HGF/HFWorkingPaper/17.10). World Health Organization.

FACTORS INFLUENCING RURAL HEALTH CARE PROFESSIONALS' ACCESS TO CONTINUING PROFESSIONAL EDUCATION IN HEALTH CARE FACILITIES.

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Abstract|

Professional development is the process by which health workers stay updated to meet the needs of patients, the healthcare service, and their own professional development. It includes the continuous acquisition of new knowledge, skills, and attitudes to enable competent practice (Dopp A.L., et al 2010). Continuing medical development includes managerial, social, and personal skills and topics beyond the traditional clinical medical subjects. It acknowledges not only the wide ranging competences needed to practice high quality medicine but also the multidisciplinary context of patient care (Brown CA, et al 2002). This includes all activities intended to improve professional knowledge, skills, or performance (Attewell, J., et al 2005).

Key words| Health care worker, Continuous Professional Education, Rural Healthcare Facilities.

Background

Global policy-makers, irrespective of their level of economic development, find it hard to attain health equity and to meet the absolute requirements concerning the health needs of their populations, especially those in rural areas. One of their major challenges is ensuring people living in rural and remote locations have access to trained health workers. Having a sufficient number of trained and motivated healthcare workers at the right place and at the right time are essential to deliver effective health services and improve health outcomes (Curran VR., et al 2004).

Having inadequate number of trained health professionals in rural areas hinders access to facilities and services which in return slows progress towards attaining the Millennium Development Goals and challenges the aspirations of achieving health for all. (Brown CA, et al 2002) .The need for rural health work professionals is global issue of concern with approximately one half of the global population living in rural areas, researches mostly shows them being served by only 38% of the total nursing workforce and by less than a quarter of the total physician work force(Rourke J., et al 2003) .

Every government has a direct influence on the health labor market through training, regulation policies, financing and information to help improve health care workers. An entirely free labor market will never lead to a well-distributed health workforce because many people are influenced by the income they earn, available facilities and open opportunities (Dornan, T.., et al 2002). In an increasingly complex healthcare environment, with major scientific and technical innovations, aging populations, increasing spread of chronic disease and major cost constraints, healthcare professionals (HCPs) are required to keep up-todate with new data and advances in order to ensure optimal patient care. Medical education for practicing HCPs in Europe is driven by different models, various providers and national regulations, and hence is very fragmented. Beyond accreditation systems, the identification of different implementation models for CME across Europe.
In the majority of European countries, medical education is provided by universities, physician associations/societies, medical education/ communication companies and the pharmaceutical industry (Dopp A.L., et al 2010).

Impact of Continuous Education in Healthcare

Inadequate Human Resources for Health has been identified globally as a major hindrance to the delivery of quality health services. This is a contributing factor to most developing countries' inability to achieve the health related millennium development goals and will undoubtedly factor in the achievement of the sustainable development goals.

In Africa, the shortage of HRH is more prevalent in rural areas, which puts an incredible strain on the health care system, resulting in preventable deaths and an increased burden of disease.
The WHO African Region, with 24% of the global weight of disease, is served by only 3% of the world's health workers. Additionally, the African continent, with the highest global disease burden, has the lowest density of health professionals (2.3 health professionals per 1000 population) and spends the lowest proportion (29.5%) of government health disbursement on health worker salaries 2006. Factors contributing to the low number of health care professionals in rural and urban underserved areas include demanding working conditions, substandard medical equipment and facilities, inadequate payment, scanty opportunities for personal and professional growth, safety concerns, and lack of job opportunities for spouse and educational opportunities for children (Wong, B.M., et al 2010).

A country's ability to recruit and retain health care professionals in underserved areas ultimately depends upon the provision of a stable, rewarding and fulfilling personal and professional environment (Ferreira, F.H., et al 2006), but most countries continue to fail to produce such an environment, independent of their income status. In resource-constrained countries, rural and other underserved areas are generally worst afflicted by problems such as unemployment, poverty, malnutrition, lack of clean drinking water and poor sanitation (Curran VR., et al 2004). These factors contribute to the poor health status of people living in these areas (Strasser, R.., et al 2016).

RESEARCH AIM

The aim of this research is to conduct a systematic review about factors that influence rural healthcare professionals' access to continuing professional development.

OBJECTIVE

1. To identify which training programmes are offered for healthcare professionals in rural areas.
2. To determine who conducts or offers training opportunities to medical professionals in rural areas.
3. To identify the benefits of regular training of healthcare professionals.

METHODOLOGY

In order to answer the aims and objectives of the research topic, secondary data was systematically reviewed. The databases used for attaining the information included PubMed, Google scholar. The utilization of the multiple databases presented the opportunity to gain accurate and reliable information that signified the primary aspects of the study. Also, the research study used the PRISMA tool for screening the research resources.

RESULTS

Identified studies were uploaded into endnote (Thomas Reuters) and duplicates were removed. 4 reviewers vetted through the study based on the topic and abstracts that met the inclusion criteria. Studies selected after the first screening were further screened through a detailed full text browsing, to further exclude studies that had some of the exclusion criteria. Out of 43 studies identified, 9 were excluded due to having abstracts only. Out of the 26 selected, 18 were further excluded due to unsatisfactory results and conclusion. Only 8 were finally used.

Fig 1.0 | Prisma Flow Chart

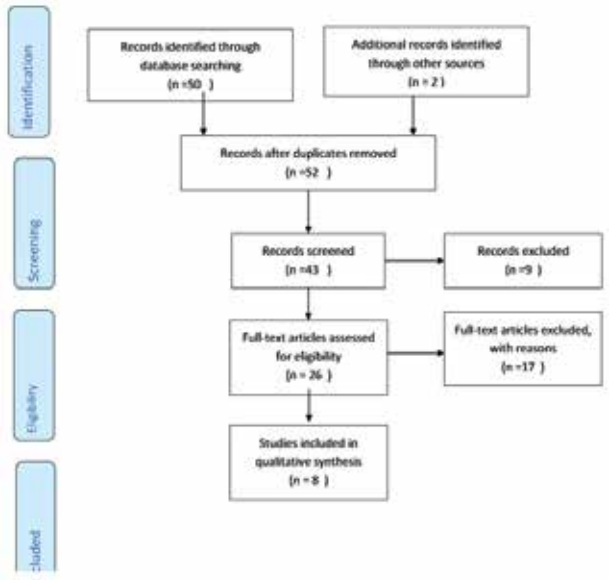
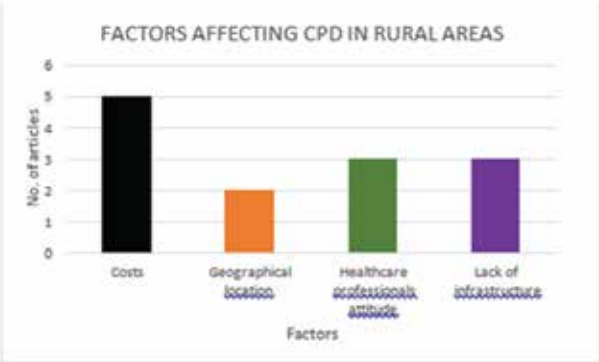


Fig 1.2| KEY RESULTS AND DISCUSSION



DATA ANALYSIS AND INTERPRETATION

COSTS

One the major hindrance of participation of healthcare professionals in rural areas in educational activities is the cost both of travelling to places with facilities were educational activities are offered (Mattheos N., et al 2001). In previous studies, it was established that the cost of travelling to far places to attend CME was amongst the main issues that discouraged healthcare professionals from participating in continuous professional development (Carriere MF., et al 2001).

Therefore some researchers suggested the establishment of facilities in which cme can be conducted in rural areas. This, they reported would help curb the main excuse that healthcare professionals give when asked about their reasons for not attending cme (Mattheos N., et al 2001) .

GEOGRAPHICAL LOCATION

Geographical location has been identified as one of the factors affecting healthcare professionals' continuing education. As already stated, healthcare facilities in rural areas are under equipped and short staffed (Curran VR,., et al 2003). This is mostly due to the location of these healthcare facilities. Healthcare professionals all over the world are generally not interested in working in these facilities as they are usually isolated and very far from other vital facilities. It is therefore this isolation that leads to limited or no continuous professional development programmes or activities in rural areas (Barer ML., et al 1999).

HEALTHCARE PROFESSIONALS ATTITUDE

Some healthcare workers, particularly those in rural areas tend to get used to the basic knowledge they acquired while they were still students and only base their entire practice on that (Dornan, T., et al 2002). They do not see the need to improve their clinical knowledge because of the environment in which they practice. The lack of certain medical equipment in their facilities gives them the impression that they do not have to accumulate much knowledge related to particular clinical management skills and knowledge (Boud, D 1999). On the contrary, some healthcare professionals perceives working in rural areas as an opportunity to use the vast amount of free time they have to participate in activities that improve their medical competence. These therefore shows that the attitude of healthcare professionals alone can determine the level of competence one maintains regardless of their location (Duke, S. and Appleton, J 2000)

LACK OF INFRASTRUCTURE

Most rural healthcare facilities are underequipped. Healthcare professionals working in rural health care facilities are often discouraged of their place of work and therefore lose morale in their profession because of having to work without all the necessary equipment and therefore disregard the process of continuing professional education (Dornan T., et al 2002). The issue of lack of proper conference rooms that are fully equipped with necessary equipment for CME adds to the factors that discourage healthcare professionals from participating in continuous professional development (Mattheos N., et al 2001).

CONCLUSION

The main factors affecting continuous professional development in rural areas were identified. These include the cost incurred in preparation and attendance

of professional development activities which are usually hosted in distant places from rural areas. This factor therefore hinders some healthcare professionals from taking part in such activities. Another factor which was identified is the attitude of healthcare professionals towards their professional development.

This is mainly how individual professionals view themselves in relation to their place of work, Some use the isolation of rural areas as a time to gear up their medical knowledge while some believe that it is of no use increasing knowledge being in an underequipped isolated area where there is no chance of using it. The attitude of healthcare professionals towards professional development will greatly determine the overall outcome of ones progression in their field of work. Lack of infrastructure was also one of the factors that were identified to hinder professional development of healthcare professionals in rural areas. Majority of activities that professionally develop healthcare professionals are carried out in well-equipped facilities, therefore the lack of these will lead to inability to engage in that. The only solution to this, suggested one of the studies, is to build facilities specifically for professional development purposes, at least one such facility easily accessible to a number of rural healthcare facilities. Geographical location impedes professional development in a similar way lack of infrastructure does but with the addition of isolation and in some cases lack of services like electricity and water supply.

REFERENCES

Attewell, J., Blenkinsopp, A. and Black, P., 2005. Community pharmacists and continuing professional development—a qualitative study of perceptions and current involvement. Pharm J. 2005; 274: 519, 524.

Austin, Z., Marini, A., Glover, N.M. and Croteau, D., 2005. Continuous professional development: a qualitative study of pharmacists' attitudes, behaviors, and preferences in Ontario, Canada. American Journal of Pharmaceutical Education, 69(1), p.4.

Barer ML, Stoddart GL.Improving access to needed medical services in rural and remote Canadian communities: recruitment and retention revisited. Discussion paper prepared for Federal/Provincial/Territorial Advisory Committee on Health Human Resources, 1999.

Boud, D. (1999). Avoiding the traps: Seeking good practice in the use of self assessment and reflection in professional courses. Social Work Education, 18, 121– 132.

Boud, D., & Walker, D. (1998). Promoting reflection in professional courses: The challenge of context. Studies in Higher Education, 23(2), 191–206.

Brown CA, Belfield CR, Field SJ. Cost effectiveness of continuing professional development in health care: a critical review of the evidence. British Medical Journal 2002; 324 (7338): 652–655.

Carriere MF, Harvey D. Current state of distance continuing medical education in North America. Journal of Continuing Education in the Health Professions 2001; 21: 150–157.

Curran VR, Kirby F, Wells L. Survey of distance learning provision in continuing health professional education in Canada. Canadian Journal of University Continuing Education 2003; 29: 51–72. 43

Curran VR, Rourke J. The role of medical education in the recruitment and retention of rural physicians. Medical Teacher 2004; 26: 265–272.

Dopp, A.L., Moulton, J.R., Rouse, M.J. and Trewet, C.B., 2010. A five-state continuing professional development pilot program for practicing pharmacists. American journal of pharmaceutical education, 74(2), p.28.

Dornan, T., Carroll, C. and Parboosingh, J., 2002. An electronic learning portfolio for reflective continuing professional development. Medical education, 36(8), pp.767- 769.

Duke, S. and Appleton, J., 2000. The use of reflection in a palliative care programme: a quantitative study of the development of reflective skills over an academic year. Journal of Advanced Nursing, 32(6), pp.1557-1568.

Ferreira, F.H. and Walton, M. eds., 2005. World development report 2006: equity and development (Vol. 28). World Bank Publications.

Mattheos N, Schittek M, Attstrom R, Lyon HC. Distance learning in academic health education: a literature review. European Journal of Dental Education 2001; 5: 67–76.

Mayer ES. Academic support for rural practice: the role of area health education centres in the school of medicine. Academy of Medicine 1990; 65: S45–S50.

Mott D. Pharmacy workforce trends: characteristics such as age and gender impact dynamic of workforce. J Pharm Soc Wisc. 2003;Jan/Feb:9-13.

Rourke J, Incitti F, Rourke L, Kenard MA. Keeping family physicians in rural practice: solutions favoured by rural physicians and family medicine residents. Canadian Family Physician 2003; 49: 1142–1149.

Strasser, R., Kam, S.M. and Regalado, S.M., 2016. Rural health care access and policy in developing countries. Annual review of public health, 37, pp.395-412.

Walker J, Thomson A, Smith P. Maximising the world wide web for high quality educational and clinical support to health and medical professionals in rural areas. International Journal of Medical Informatics 1998; 50: 287–291.

Wong, B.M., Etchells, E.E., Kuper, A., Levinson, W. and Shojania, K.G., 2010. Teaching quality improvement and patient safety to trainees: a systematic review. Academic Medicine, 85(9), pp.1425-1439. 46

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FACTORS INFLUENCING RURAL HEALTH CARE PROFESSIONALS' ACCESS TO CONTINUING PROFESSIONAL EDUCATION IN HEALTH

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Abstract |

Health care involves the participation of the patients and the highly specialized health care professionals whom the community has a high reliance in them as the health care providers. Hence the quality of the service they provide depends on their training. Therefore, this study is concerned much on how their training had an impact on the effectiveness and productivity of the health care workers.

Key words | Continuing Professional Education (CPE), Rural Health care professionals, Career development.

Background

Obesity The recruitment and retention of health care professionals, especially those working in rural communities, has been identified as a key issue to the sustainability of rural health care systems in a number of countries (Curran VR., at al… 2006). Hence Professional Continuing Education (CPE) for health professionals is significant to guarantee that their practice remains contemporal and of the utmost quality (Hill P., at at…1996).

The role of the CPE process is to motivate each health care worker into keeping up with the modifications in training and to guarantee that the communal confidence in their amenities they offer are being recollected and advanced (Saade S., et al…2018). Continuing professional development (CPD) has become an increasingly important factor of most professions, especially those related to health care (Saade S., et al…2018). The International Pharmacy Federation declared: "Maintaining competence throughout a career during which new and challenging professional responsibilities will be encountered is a fundamental ethical requirement for all health professionals" (Ghazala ., et al 2018). Professional development (PD),including both formal for-credit continuing medical education (CME) and informal learning pursued in response to patient-oriented clinical questions or other self?identified learning gaps, is crucial to every physician's professional career (Cook DA., et al 2016). Continuing professional development is the progression by which health specialists keep modernised

to encounter the needs of patients, and their own proficient growth. It includes the non-stop achievement of fresh knowledge, abilities, and attitudes to permit experienced training (Peck C., et al 2000). It can range from training days to mature

skills and knowledge in certain zones in the health care system to longer courses of learning that lead to an educational reward (EFN Report., et al… June 2006). Current health care workers must perform in compound and varying health care system, constantly rejuvenate and bring up to date their knowledge and skills, and structure difficult patients and healthcare complications. Preparing health care experts who possess these competences is similarly difficult (Mann K., et al 2007).

However, professional segregation in country sides and inaccessible areas restrict medical officers' chances to keep up-to-date of modifications in training and their access to good continuing education curriculums which are acknowledged by their particular line of work (Hill P., at at…1996).

Remoteness often adds to the cost of presence in selected CPE events and could increase the period of separation from family and work. Other obstacles comprise work pledges, lack of information and no access to applicable CPE programmes (Curran VR., at al… 2006). The World Health Organization defines the public responsibility of medical institutes as the duty to direct education and academic studies to addressing the significance health worries of the community, constituency, and/or country that they have an obligation to serve. To accomplish this aim, it is key for medical institutes to work in partnership with additional sets of professionals and health care establishments (Fleet LJ., et al 2008).).

In many countries, some health care workers i.e. nurses have CPE tool that is used to monitor the regularity of attendance of the staff to CPE programs and after a certain period, responsible authority review and assess them. Hence this can give rise to good quality performances from workers (EFN Report., at al… June 2006).

Fresher health care professionals may be changing to online technology for partaking in CPE, most of them choose home-based learning tools over stretched distances for CPE. Countryside practitioners articulated remoteness being the major barrier to access to CPE. They felt that direct networking was similarly essential (Holuby RS., et al… 2015). As a line of work, nurses continuously remained involved in continuing professional development and education. Implied in this is the theory that nurses will sustain, progress and improve capability through CPE.

The essential for nurses to keep and modernise their knowledge and skills is crucial for attaining and sustaining excellence in service delivery, and is in keeping with a wider appreciation that lifetime education, embracing both post-basic education, is a continuing obligation for every health care worker (EFN Report., et al… June 2006). Inspired by improvements and creativities in other nations, the Pharmacy Board of Lebanon (OPL) gave out principles for compulsory CPE in 2011 that took influence essentially after 3 years.

Therefore, pharmacologists working in Lebanon are obligatory to write at least 15 credits of CPE activity yearly, of which A minimum of 5 should be "live" CPE (Saade S., et al…2018). Individual pharmacist was required to submit ones documents for assessment and checking. Failure to achieve these criterions may perhaps lead to penalising action up to license suspension. Moreover, the OPL is still functioning in the direction of transitioning from CPE to CPD (Saade S., et al…2018). There is no big difference between CPE and CPD, as throughout the previous decade CPE included executive, societal, and individual talents, subjects further than the traditional clinical medical subjects. The word CPD recognises not only the extensive capabilities required to carry out great quality medicine but as well the multi-corrective framework of patient care (Peck. C., et al 2000).

RESEARCH AIM

To evaluate factors influencing rural health care Professionals' access to continuing professional education in health facilities.

OBJECTIVE

1. To identify factors influencing continuing professional education in rural health care facilities. 2.To identify the strategies that can be used to improve the challenges faced by rural health care workers to have access towards continuing professional education.

METHODOLOGY

In order to answer the aims and objectives of the research topic, secondary data was systematically reviewed. The databases used for attaining the information included PubMed, Google scholar. The utilization of the multiple databases presented the opportunity to gain accurate and reliable information that signified the primary aspects of the study. Also, the research study used the PRISMA tool for screening the research resources.

RESULTS

Identified studies were uploaded into endnote (Thomas Reuters) and duplicates were removed. 4 reviewers vetted through the study based on the topic and abstracts that met the inclusion criteria. Studies selected after the first screening were further screened through a detailed full text browsing, to further exclude studies that had some of the exclusion criteria. 20 records were found through database searching and other sources, 3 studies

Cwere excluded as they were duplicates. 3 more were further excluded as they had abstracts only and 7 full texts were also excluded because they met some of the exclusion criteria. Only 7 studies were used.

Fig 1.0 | Prisma Flow Chart

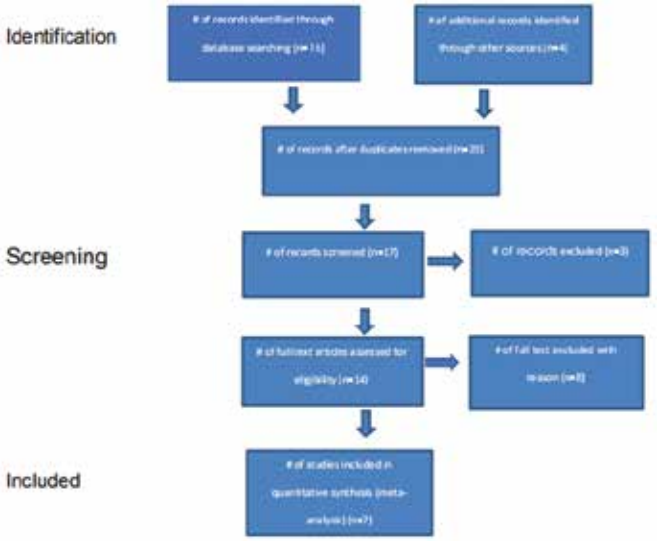


Fig 1.2| KEY RESULTS AND DISCUSSION

DATA ANALYSIS AND INTERPRETATION

The GEOGRAPHICAL LOCATION

Of the 7 articles that we used, all of them identified geographical location at 85.7% as the leading factor among all. The more the remoteness of the area the more it is difficult for services to reach in time, be it CPE or any other services because of the few population in those segregated areas. According to Curran et al, remoteness often adds to the cost of presence in selected CPE events and could increase the period of separation from family and work. Also in rural regions most of the time there are individual health care workers placed hence they are to provide health services always hence cannot leave the community with no service providers, just to attend the CPE workshop in urban areas. Hence modern technology could be of good use to those remote areas I.e. video teachings as those rural health care workers would have access to CPE programs as well as delivering the health services to the community, as CPE won't be done at the cost of the patients' health.

LACK OF RESOURCES / FUNDING

6 articles out of 7 mentioned "Lack of resources /funding" as it disturbs delivery of CPEin rural areas. Because of lack or shortage of resources used in the health care system e.g. advanced equipment like CT scans, patients are referred to developed regions as they have those CT scans lacking in rural areas. Hence professional in rural areas miss a chance to get know much about those advanced equipment since they do not have them in their remote areas. Also most of CPE workshop lack funding from the government as most of the funding is on the urban sophisticated areas. As stated by Curran VR et al, lack of funding include expenses linked to improving and providingCPE courses, along with charges linked to transportation and staff replacement. As an governmental objective, increased funding to support CPE access would appear to be a main approach. Also CPE supervisors should be hired.

LACK OF TIME

Some articles stated that time constraints to be a destruction for CPE to reach rural health professionals as they spend more than 10 hours delivering health services to patients hence they too have no or little time for continuing medical education especially since the work individually in health post and rural clinics as reported by Saade S et al. About 4 articles read stated that. Hence all medical institutions should be involved in Continuing medical Education, which would allow health care workers in rural areas to participate because they wouldn't have to go outside the institutions for the CPE, day offs should be given so as to give professionals rest so have time for CPE.

LACK OF MANAGEMENT SUPPORT

Lack of management support which also have a great influence in CPE, if the management of the health care institution fails to back the professionals on CPE then CPE would not be taken serious and professionals would not benefit from CPE hence poor performance. Also, Siddiqui ZS reported lack of consensus about which organization should monitor CPD. No one association has enough resources or the credibility to take the responsibility for administering this program. Some suggested international or non-governmental organizations to monitor CPD.

TOO EXPENSIVE

Some of the professionals noted CPE to be "Too expensive" as they use their own money for the CPE expenses, either through internet or self-arranged workshops without any support from the government, since most of the CPE take more than 1 day to train hence workers would need to spend more on accommodation, food and transport which would be very expensive. Hanson AL et al said that certain approaches like if the government intervene and sponsor this continuing medical education would make it easier for professional to access CPE.

with other health care professionals to be kept updated on schedules and other things concerning CPE courses. Therefore the government should provide the telecommunication equipment to all health care facilities in the country so that it becomes easy and fast to access CME and the health care workers should be taught on how to operate those telecommunications to utilise them appropriately.

NEGATIVE ATTITUDE TOWARDS CPE

Of all the articles used in the systematic review, none of them has shown that health care workers have negative attitude towards CPE. That simply means most of the health workers are interest to learn and updating their skills and knowledge time and again for their entire time. And most of them are doing the CME courses on their own leisure time and using internet café with their own money. Attitude and motivation have presented to be essential elements in CME involvement. As Hill P et al stated, within the pharmacy career, and in other CME practices of other health care workers, the attitude and magnitude of motivation has been acknowledged.

CONCLUSION

The In brief, the necessity for continuing professional education is universally acknowledged. However there are barriers that affect the professionals' access to CPE. Among the factors, geographical location and lack of funding or equipment are identified as the key factors. Seeing most of the practitioners and nurses have a positive attitude towards CPE, all professional should know that they have individual accountabilities to take part in continuing professional Education and has choice of a variety of recognised educational activities to accomplish that duty. Though a mandatory system appears impossible currently, some principles could be laid down to introduce the CPE platform. All professional have individual accountabilities to take part in continuing professional Education and has choice of a variety of recognised educational activities to accomplish that duty.

According to information on literature, professionals' access to continuing specialized training can be mostly affected by environmental, funding factors etc. Obstacles such as location and lack of financial supports were acknowledged as features affecting continuous professional education in countryside. Lowly technological set-up to provide quality services to meet patients' needs also hinder professional access to regular training. Evaluated writings mentioned that if health care workers reflect on themselves and identified loopholes on the CPE and learning needs especially in rural areas. A quiet number reports recorded time as an influential characteristics in remote areas as well as they are assigned solitarily in those communities.

Moreover, union boards and associations to test specialized health personnel's competency should be in place and limiting the proof to practice since new things are being discovered and learned hence professional have to pass via test to be issued a new validation. And this interventions should be focused more on postgraduates as they are still enthusiastic and have fresh minds, unlike the old ones who been practices for many years. Lastly health care professional in rural areas could use some stimulus so as to improve CPD.

REFERENCES

Al-Turki, H.A., 2012. Prevalence and risk factors in Bhatnagar, K., Srivastava, K., 2012. Job satisfaction in health-care organizations. Ind.

Bishop, D.V.M., 2013. Research Review: Emanuel Miller Memorial Lecture 2012–Neuroscientific studies of intervention for language impairment in children: interpretive and methodological problems. Journal of Child Psychology and Psychiatry, 54(3), pp.247-259.

Braido, FT, Popov I J, Ansotegui, J. Gayraud, KL. Nekam, J. L. Delgado, H. J. Mailing S. Olson M. Larche A. Negri, and G. W. Canonica. 2005. Continuing medical
education: An international reality. Allergy: European Journal of Allergy and Clinical Immunology 60(6):739-742.

Bvumbwe T, Mtshali N, Feldacker C, Pintye J, Jacob S, Chung MH, Middleton L, Kim N.Nursing education challenges and solutions in Sub Saharan Africa: an integrative review. BMC Nursing 2018.

Cheetham G, Chivers G. How professional learn in practice: an investigation of informal learning amongst people working in professions. Journal of European Industrial Training, 25(5), 248-92
Collins, A, Bobrow, D.G. eds., 2017. Representation and understanding: Studies in cognitive science. Elsevier.

Cook DA, Blachman MJ, Price DW,West CP, Berger RA, Wittich CM. Professional development perceptions and practices among U.S. Physicians: A cross-specialty national survey. . Academic Medicine, Vol. XX, No. X/ XX XXXX
Creswell JW. and Creswell, J.D., 2017. Research design: Qualitative, quantitative, and mixed methods approaches. Sage publications
Curran VR, Fleet L, Kirby F. Factor's influencing rural health care professionals' access to continuing professional education. Aust J Rural Health 2006; 14: 515

Eraut M. Informal learning in the workplace. Studies in Continuing Education, 26, 2, 27-73
European Federation of Nurses Associations (EFN) Country Report on CPD in nursing country report on continuing professional development in nursing (EFN 2012)

Evers AT, Van heijiden B,I,J,M, Kreijns K, Gerrichhauzen JTG, Organizational factors and teachers' professional development in Dutch secondary school. Journal of European industrial training 35,1,24-44

Fahey T, Senior lecturer in General Practice, division of primary health care, University of Bristol. Revalidation for doctors should reflect doctors' performance and continuing professional development. BMJ 1998; 317:1095-6

Fleet LJ, Kirby F, Cutler S, Dunikowski L, Nasmith L, Shaughnessy R, Memorial University of Newfoundland. Continuing professional development and social accountability: A review of the literature. Journal of Interprofessional Care, June 2008; 22(S1): 15–29
Flick, U. ed., 2013. The SAGE handbook of qualitative data analysis. Sage.

Grbich, C., 2013. Integrated methods in health research. Research methods in health: Foundations for evidence-based practice, pp.312-322.
Hanson AL, Bruskiewitz RH, DeMuth JM. Pharmacists' Perceptions of Facilitators and Barriers to Lifelong Learning. American Journal of Pharmaceutical Education 2007; 71 (4) 67.

Hill P, Alexander T, Faculty of Nursing and Diabetes Centre. Continuing professional education: a challenge for rural health practitioners. Australian Journal of Rural Health (1996) 4, 275-279
Holuby RS, Pellegrin KL, Barbato A, Ciarleglio A. Recruitment of rural healthcare professionals for live continuing education. Medical Education Online, 20:1, 28958
Howell, D.C., 2012. Statistical methods for psychology. Cengage Learning.

Hoyal FMD. 'Swallowing the medicine': determining the present and desired modes for delivery of continuing medical education to rural doctors. Aust J Rural Health 1999; 7: 212 15
Illeris K, 2009. Contemporary Theories of Learning: Learning Theorists in Their Own Words. Routledge, London.

Kasvosve I, Ledikwe JH, Phumaphi O, Mpofu M, Ngangah R, Motswaledi MS, Martin R, Semo B. Continuing professional development training needs of medical laboratories in Botswana. Human Resource for health 2014, 12:46
Kmietowicz Z. Revalidation must serve doctors and the public. British Medical Journal 2005 330(7502):1229.

Kohlbacher, F., 2006. The use of qualitative content analysis in case study research. In Forum Qualitative Sozialforschung/Forum: Qualitative Social Research (Vol. 7, No. 1, pp. 1-30). Institut für Qualitative Forschung.

Mann K, Gordon J, MacLeod A. Reflection and reflective practice in health professions education: a systematic review. Advances in Health Sciences education (2009)14:595-621
Marsick VJ, Watkins KE. Informal and incidental learning. New directions for adult and continuing education, 2001(89), 25-34
Mathers N, G. Maso, J. Heyrman, and O. S. Gaspar. 2007. LOTUS: An evaluation of a European continuing professional development programme. Education for Primary Care 18(3):328-337.

Maurer TJ, Employee learning and development orientation: Towards an integrative model of involvement in continuous learning. Human Resource Development Review, 1,1,9-44
Merkur S, Mossialos E, Long M, McKee M. Physician revalidation in Europe. Clinical Medicine, Journal of the Royal College of Physicians of London 2008, 8(4):371-376.

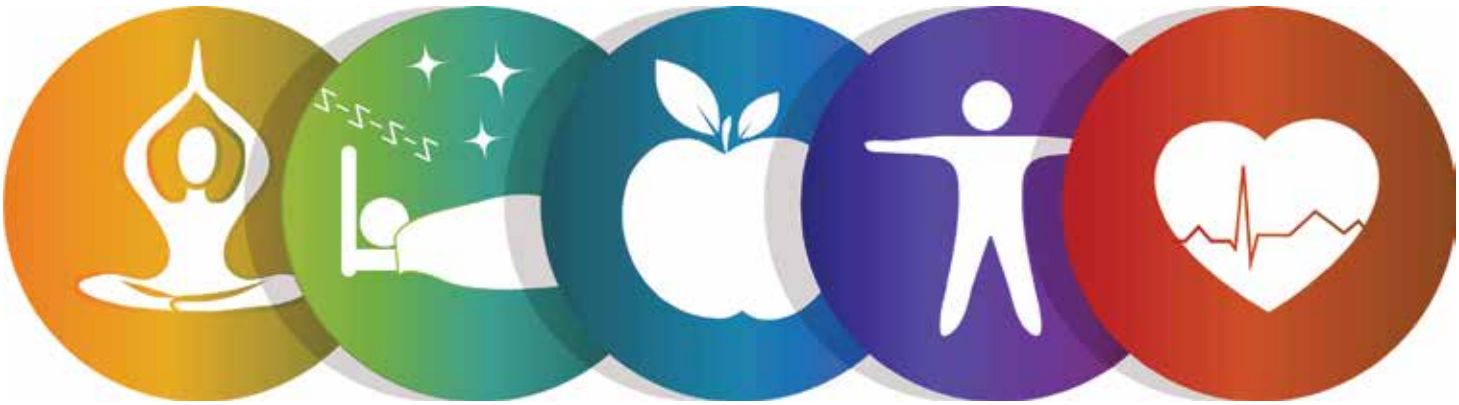
Miles, M.B. and Huberman, A.M., 86. Saldana. (2014). Qualitative data analysis: a methods sourcebook. Qualitative Data Analysis: A Methods Sourcebook, pp.275-322.
Peck C, McCall M, McLaren B, Rotem T. Continuing medical education and continuing professional development: International comparisons. British Medical Journal 2000 320(7232):432-435.

Pelletier S. 2010. "Globalizing CME's future." Medical Meetings 37, no. 6: 35-37.
Psychiatry J. 21 (1), 75
Saade S, Ghazala F, Farhat A, Hallit S. Attitudes toward continuous professional development: A study of Pharmacist in Lebanon. Pharmacy practice 2018 Jan-Mar; 16(1):1103
Samson N. 2006. Continuing professional development: A southern perspective. International Hospital Federation Reference Book 2005/2006. Nairobi, Kenya: Pathfinder International. http://www.ihf-fih.org/en/
Schutt, R.K., 2014. Investigating the social world: The process and practice of research. Sage Publications.

Siddiqui ZS, Secombe MJ, Peterson R. Continuous professional Development Development of a framework for medical Doctors in Pakistan. Journal of Pakistan Medical Association Vol. 53 No.7, 2003

Smith E, Smith A, Pickersgill R, Rushbrook P. Qualifying the workforce. The use of nationally-recognised training in Australian companies. Journal of European Industrial Training, 30, 8,592-607

Van Der Velden T, Nguyen VH, Nguyen QY, Ngo VH, Baron R. 2010. "Continuing medical education in Vietnam: New legislation and new roles for medical schools." Journal of Continuing Education in the Health Professions 30, no. 2: 144-148.
Walton M, Barraclough B, Faculty of Medicine, Sydney School of Public Health.Clinical supervisors: are they the key to making care safer? BMJ Qual Saf 2013; 22:609–61
Younies H, Belal B, Smith PC. 2010. "Perceptions of continuing medical education, professional development, and organizational support in the United Arab Emirates." Journal of Continuing Education in the Health Professions 30, no. 4: 251-256.



THE EFFECT OF LIFESTYLE CHANGES ON BLOOD PRESSURE CONTROL AMONG HYPERTENSIVE PATIENTS

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ABSTRACT

Much evidence has emerged on the significance of lifestyle modification of hypertension control, its efficacy and safety as management. However, fewer studies exist that put an emphasis on healthy lifestyle choices (balanced diet, increased physical activity) and the vital role they have on hypertension control in Botswana. The purpose of this study was to give a detailed review on The Effects of Lifestyle Changes on Blood Pressure Control among Hypertensive Patients. . A computerized search was done in four different data bases published, Google, PubMed, Medline and Embase on the 20th June 2019. A thorough step by step guidance of the PRISMA checklist was followed. Research articles that investigated the effectiveness of lifestyle modifications on hypertensive patients were appropriate. The practicality of the selected studies was analysed using PICOS checklist. To conclude on the consistency of the selected studies, the current review assessed; 1) description of the measures implemented, 2) results of the measures implemented and 3) population characteristics. 5 studies were found eligible, overall; low salt intake, reduced alcohol intake, smoking cessation, BMI control and stress management could be summarized to have an effect on hypertension control, however most of these measures have a higher impact on hypertension reduction when implemented together. Maintaining a normal BMI alone showed a significantly higher decrement on hypertension.

Key words | Effects, Hypertension, Non-Communicable Diseases.

Background

Lifestyle modification, formerly called non-pharmacological therapy, has a vital role in hypertensive as well as non-hypertensive individuals. In hypertensive individuals, lifestyle modifications can be implemented as initial treatment before the start of drug therapy and as an adjunct to medication in persons already on pharmacological treatment (Stamler, J., et al 1989).

In hypertensive patients with medication-controlled BP, these therapies can facilitate drug step-down and drug withdrawal in highly motivated individuals who achieve and sustain lifestyle changes (Whelton, P.K., et al 1998). In non-hypertensive, lifestyle modifications have the potential to prevent hypertension, and more broadly to reduce BP and thereby lower the risk of BP-related clinical complications in whole populations (Lawrence J. Appel P., et al 2003). Indeed, even an apparently small reduction in BP, if applied to an entire population, could have an enormous beneficial effect on cardiovascular events.

For instance, a 3-mmHg reduction in systolic BP should lead to an 8% reduction in stroke mortality and a 5% reduction in mortality from coronary heart disease (WHO 2003). Modifiable risk factors such as healthy lifestyle would indeed, if followed the proper way, reduce the incidence or progression of one developing hypertension as most researches indicate poor lifestyle choices such as diet being the most leading cause of the disease,(Christiana Nsiah-Asamoah., et al 2017)

Found that high intake of sodium is common in most African countries where salt is used to preserve food or to make it tastier. They further reported that nutritional factors may explain 30-75% cases of hypertension and therefore recent efforts to reduce the prevalence of hypertension have focused on lifestyle modification strategies, specifically diet. This further supports the purpose of this systematic review, a blueprint to a large scale nationwide research. (Hien et al, 2018) Also found that the impact of hypertension is influenced by a wide variety of risk factors such as tobacco use, excessive alcohol consumption, unhealthy diet, physical inactivity, overweight and obesity, elevated blood glucose and abnormal blood lipids. All aspects of lifestyle basically emphasizing a change in the listed factors would significantly reduce risk factors in the general population, primary prevention in the high risk groups and be an intensive method of management in secondary prevention.

EPIDEMIOLOGICAL DATA OF RESEARCH TOPIC

Worldwide, elevated blood pressure is approximated to cause 7.5 million deaths, about 12.8% of the total of all deaths. This accounts for 57 million disability adjusted life years (DALYS) or 3.7% of total DALYS (WHO 2019).

Elevated blood pressure is a main risk factor for coronary heart disease and ischemic as well as haemorrhagic stroke. Blood pressure levels have been shown to be positively and continuously related to the risk for stroke and coronary heart disease. In some age groups, the risk of cardiovascular disease doubles for each raise of 20/10 mmHg of blood pressure, starting as low as 115/75 mmHg.(WHO 2019) further states,

In addition to coronary heart diseases and stroke, impediments of raised blood pressure include heart failure, peripheral vascular disease, renal impairment, retinal hemorrhage and visual loss. Treating systolic blood pressure and diastolic blood pressure until they are less than 140/90 mmHg is associated with a reduction in cardiovascular complications.

The preventive actions concern habits and lifestyle monitoring. Two important low (or no)cost preventive measures are: first, a decrease in dietary salt consumption,(Douglas GJ., et al 2003) and second, a greater awareness of the implications of obesity.(Bovet P., et al 2002) There is good proof that a decrease in salt intake reduces blood pressure and that black people are more sensitive than white people in this regard.(Cappucio FP .,et al 2000) Other measures, such as increased physical exercise,(Oppie-Lh et al 2005) decreased obesity, cessation of smoking and limited alcohol consumption,(Appel LI ..,et al 2003) are all as important in black subjects as in whites in the prevention and control of hypertension.

RESEARCH AIM

To assess the effects of lifestyle changes on blood pressure control among hypertensive patients.

OBJECTIVE

1. To identify lifestyle modifications used to control blood pressure among hypertensive patients.
2.2. To determine the efficacy of lifestyle modification as a mode of intervention in diagnosed hypertensive patients.

METHODOLOGY

In order to answer the aims and objectives of the research topic, secondary data was systematically reviewed. The databases used for attaining the information included PubMed, Google scholar. The utilization of the multiple databases presented the opportunity to gain accurate and reliable information that signified the primary aspects of the study. Also, the research study used the PRISMA tool for screening the research resources

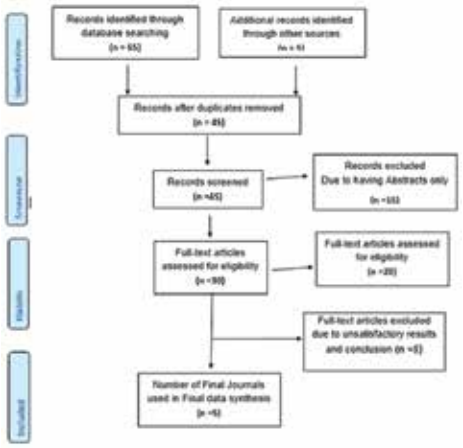
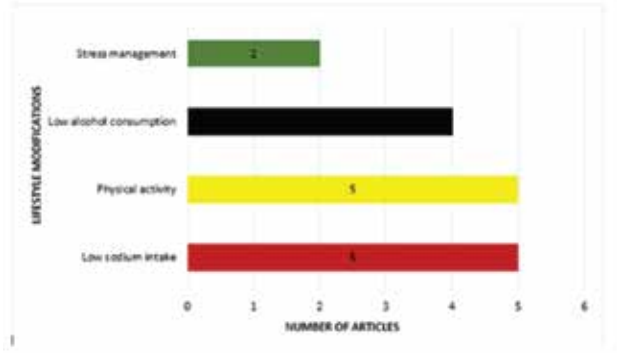


Figure 1.0; PRISMA CHART FLOW

RESULTS

Identified studies were uploaded into endnote (Thomas Reuters) and duplicates were removed. 2 reviewers vetted through the study based on the topic and abstracts that met the inclusion criteria. Studies selected after the first screening were further screened through a detailed full text browsing, to further exclude studies that had some of the exclusion criteria. Out of 70 studies identified, 25 were excluded due to duplication. Out of the 45 selected, 15 were excluded due to having abstracts only. Out of the 30 selected, 25 were further excluded due to unsatisfactory results and conclusion. Only 5 were finally used.

Fig 1.2| KEY RESULTS AND DISCUSSION



DATA ANALYSIS AND INTERPRETATION

LOW SODIUM INTAKE

Reduction of dietary salt intake might be an option to antihypertensive medications or may enhance such medications. Salt reduction has been proposed as a conceivable adjunct to pharmacologic treatment to improve blood pressure control (Fodor, J.G., et all 1999).Several studies have researched this issue and discovered that, for hypertensive patients who are using antihypertensive medication, salt restriction offers added advantages in terms of blood pressure control. Midgley and partners found that in preliminaries with hypertensive subjects, the adjusted reduction in blood pressure related with a decrease in day by day sodium intake of 100 mmol was 3.7mmHg for systolic blood pressure and 0.9mmHg for diastolic blood pressure. This impact was more articulated in individuals older than 44 years old. In a subgroup examination utilizing just trials in which the mean age was 44 years or older (Midgley, J.P., et al 1996), the reduction was a lot more prominent: for a decrease in day by day sodium intake of 100 mmol the decrease in systolic blood pressure was 6.3 mm Hg and the decrease in diastolic blood pressure was 2.2 mm Hg (Midgley, J.P., et al 1996).

For more youthful hypertensive patients, the reduction was 2.4mmHg for systolic blood pressure and insignificant for diastolic blood pressure. (TOHP2, stage 2 of the Trials of Hypertension Prevention) recorded that sodium decrease, alone or joined with weight reduction, can diminish the occurrence of hypertension by roughly 20%. In the (TONE, Trials of Non-Pharmacologic Interventions in the Elderly), a decreased salt consumption with or without weight reduction viably diminished BP and the requirement for antihypertensive medicine in older people. To lessen salt intake, shoppers ought to pick sustenance low in salt and reduce the amount of salt added to food (Appel, L.J., et al 2003). Nonetheless, even driven people think that it's hard to diminish salt intake as a result of the enormous amount of salt included by food makers during food preparation (Appel, L.J., et al 2003). Henceforth, any important methodology to decrease salt intake must include the efforts of food manufacturers who ought to lessen the measure of salt included during food preparation.(Appel, L.J., et al 2003)

PHYSICAL ACTIVITY

For all intents and purposes that has analysed the impact of weight reduction on BP has archived that weight loss lowers BP (National Institutes of Health, 1998.)The significance of this relationship is fortified by the high and expanding prevalence of overweight and obesity through the globe. Interestingly, drops in BP take place before (and without) accomplishment of desired body weight (Appel, L.J., 2003). In one investigation that summed up results across 11 weight loss trials, average systolic and diastolic BP reductions were 1.6/1.1 mmHg per kilogram of weight loss (Staessen, J., 1989). Increased BMI was adversely connected with satisfactory blood pressure control. The complete rate of fruitful blood pressure control was 84.4% (64.6% female and 35.4% male).Among the standard attributes, age, sex, salt admission, and family history of hypertension indicated measurably noteworthy contrasts between the success group and failure group(Yang, M.H., et al 2017).Adding to a direct positive outcome on BP, increased physical activity should also decrease BP by facilitating initial weight loss and by encouraging upkeep of weight loss, once attained (Appel, L.J., 2003). In summary, these conclusions support the commendation of the US Surgeon General that individuals workout 30 min or more most, if not all, days of the week.

ALCOHOL CONSUMPTION REDUCTION

An enormous number of cross-sectional and forthcoming epidemiological investigations have more than once shown that alcohol consumption is one of the most significant modifiable risk factors for hypertension among populaces from an assortment of geographic areas, including North America, Europe, Africa and Asia.(He, J. also, Bazzano, L.A., 2000, Keil, U.1998) The decrease in liquor consumption of 30 units/wk was related to a 5 mm Hg fall in diastolic BP. This is steady with the results of (Puddey, I.B., et al, 1987) who discovered practically identical falls in BP with comparable decreases in alcohol consumption.

The positive relationship between liquor intake and blood pressure (BP) for the most part continues after alteration of significant confounders, for example, age, weight, smoking, exercise, and sodium and potassium consumption. Various clinical trials have been done to look at the impacts of a decrease in alcohol intake on BP (Potter, J.F., et al 1984,).

Conclusions show that a decrease in liquor consumption among substantial consumers altogether decreases systolic and diastolic BP. Moreover, this investigation proposes that liquor decrease ought to be prescribed as a significant segment of way of life change for the counteractive action and treatment of hypertension among substantial drinkers (Xin, X., et al 2001).In the Prevention and Treatment of Hypertension Study, which studied moderate-to-overwhelming consumers, a decrease in alcohol consumption brought BP down to a little, non-noteworthy degree (Parker, M., et al 1990).

In clinical practice, such techniques are not practical, and the primary strategy for controlling alcohol intake depends on advice to the patient from the doctor to decrease alcohol consumption, such counsel has been given as a major aspect of non-pharmacological treatment of hypertension (Maheswaran, R., et al 1992). In conclusion, accessible evidence encourages constraining alcohol consumption to close to two beverages for every day (men) and one beverage for each day (ladies) among individuals who drink (Appel, L.J., 2003).

STRESS MANAGEMENT

Methodologies utilized in individualized cognitive stress therapy incorporate expanding attention to stressors and stress reactions, reconsidering negative life occasions, communication skills training (e.g., marital communication and assertiveness training), improvement of problem solving skills, the controlling of negative feelings (e.g., outrage and tension) and strategies for diminishing sympathetic excitement (e.g., relaxation work outs)(Spence, J.D., et al 1999). There is no proof that stress management prevents hypertension, however there is some proof that stress management can decrease blood pressure in hypertensive patients (Spence, J.D., et al 1999).

Despite the fact that the proof demonstrated that singlecomponent interventions, for example, transcendental meditation and relaxation therapy could be adequate in certain centers. Meta-investigation indicated just little impacts or no decrease in blood pressure. In one meta-investigation (Dull, V.T. et al 1995) the adjustment in blood pressure with such intercessions was – 1.5 to +2.9/ – 0.8 to +1.2 mm Hg, while the change was – 9/ – 6 mm Hg in a second meta-analysis (Linden, W., et al 1994).

More of late, it has been demonstrated that the ascent in blood pressure during mental pressure initiated by a frustrating psychological task is a more grounded indicator of progression of carotid atherosclerosis than any of the Framingham risk factors (Barnett, P.A., et al 1997). Critical connections have additionally been found between clinical signs of coronary artery disease and a standard of conduct,(Barnett, P.A., et al 1997) just as elevated amounts of life stress(Dembroski, T.M., et al 1985) and employment strain (Williams, J.R., et al 1980). Also, affiliations have been seen between stress and coronary artery atherosclerosis, as assessed by angiography (Dembroski, T.M., et al 1985,

Williams, J.R., et al 1980). At long last, one examination found a relationship between standard of conduct and carotid artery atherosclerosis, as measured by ultrasonography (Glagov, S., et al 1989). These discoveries recommend a connection between psychosocial variables and atherosclerosis; be that as it may, the particular idea of the affiliation isn't known. One speculation is that cardiovascular reactivity, or the reaction of the cardiovascular framework to stress, may intercede this connection (Spence, J.D., et al 1989). There is presently adequate proof to state that individualized cognitive behavioral stress therapy reduces blood pressure for up to a year. For hypertensive patients in whom stress has all the earmarks of being a significant issue, stress management ought to be considered as a mediation. Individualized behavioral intercessions are bound to be successful than single part mediations (Spence, J.D., et al 1989).

CONCLUSION

Findings from this systematic review revealed that, Individualised multicomponent lifestyle modifications such as decrease in BMI, low sodium intake, smoking / alcohol cessation, are effective interventions in controlling BP among hypertensive patients; provided there are used as recombinant with pharmacological treatment; so as to reduce risk for complications of HTN and mortality rates. Early lifestyle modification is a good value for HTN prevention in high risk groups and the population.

Prevention strategies applied early in life provide the greatest long term potential for avoiding the precursors that lead to hypertension, and elevated BP levels, and for reducing the overall burden of BP related complications in the community, evidence base was minimal warranting for further research and investigation.

The panels established no proof that harm would come to patients who followed these commendations. The broad application of these recommendations is strongly encouraged because of the valuable outcome they could have on overall mortality rates, as well as on cardiovascular disease, osteoporosis, alcohol-related violence and certain cancers. However, as for all general recommendations, the physician must contemplate each patient independently and gage the risks and benefits of every therapy before providing advice. There are certainly costs associated with lifestyle modification, but they were not measured in the studies reviewed.

Continuation to assess the effectiveness of the intervention should last for at least a year, and even longer follow-up is desirable. Long-standing studies of clinically significant outcomes such as death and myocardial infarction are ultimately essential to show the efficacy of lifestyle interventions.

Cultural customs, inadequate attention to health education and lack of referral to registered dieticians, economic disincentives lack of compensation for hypertension prevention counselling services by third party payers and other obstacles to prevention of hypertension continue to hinder progress. In spite of the recognized challenges to effecting these recommendations, the probable health benefits makes continuous efforts to succeed at prevention and control of hypertension an important national objective.

REFERENCES

Akinkugbe, O.O. and Akinyanju, O.O., 1997. Final Report-national Survey on noncommunicable diseases in Nigeria. Lagos: Federal Ministry of Health, pp.65-68.

Bovet P, Ross AG, Gervasoni JP, Mkamba M, Mtasiwa DM, Lengeler C et al. Distribution of blood pressure, body mass index and smoking habits in the urban population of Dar es Salaam, Tanzania, and associations with socioeconomic status.

Fodor, J.G., Whitmore, B., Leenen, F. and Larochelle, P., 1999. Lifestyle modifications to prevent and control hypertension. 5. Recommendations on dietary salt. Canadian Hypertension Society, Canadian Coalition for High Blood Pressure Prevention and Control, Laboratory Centre for Disease Control at Health Canada, Heart and Stroke Foundation of Canada. CMAJ: Canadian Medical Association Journal, 160(9), p.S29.

Grassi, G., Cifkova, R., Laurent, S., Narkiewicz, K., Redon, J., Farsang, C., Viigimaa, M., Erdine, S., Brambilla, G., Bombelli, M. and Dell'Oro, R., 2010. Blood pressure control and cardiovascular risk profile in hypertensive patients from central and eastern European countries: results of the BP-CARE study. European heart journal, 32(2), pp.218-225.

Kearney, P.M., Whelton, M., Reynolds, K., Muntner, P., Whelton, P.K. and He, J., 2005. Global burden of hypertension: analysis of worldwide data. The lancet, 365(9455), pp.217-223.

Klatsky, A.L., Friedman, G.D., Siegelaub, A.B. and Gérard, M.J., 1977. Alcohol consumption and blood pressure: Kaiser-Permanente multiphasic health examination data. New England Journal of Medicine, 296(21), pp.1194-1200.

MacMahon, S., Peto, R., Collins, R., Godwin, J., Cutler, J., Sorlie, P., Abbott, R., Neaton, J., Dyer, A. and Stamler, J., 1990. Blood pressure, stroke, and coronary heart disease: part 1, prolonged differences in blood pressure: prospective observational studies corrected for the regression dilution bias. The Lancet, 335(8692), pp.765-774.
Midgley, J.P., Matthew, A.G., Greenwood, C.M.T. and Logan, A.G., 1996. Effect of reduced dietary sodium on blood pressure: a meta-analysis of randomized controlled trials. Jama, 275(20), pp.1590-1597.

Control Among Hypertensive Patients. Lifestyle Changes and Blood Pressure control.
Neaton, J.D., Grimm, R.H., Prineas, R.J., Stamler, J., Grandits, G.A., Elmer, P.J., Cutler, J.A., Flack, J.M., Schoenberger, J.A., McDonald, R. and Lewis, C.E., 1993.

Treatment of mild hypertension study: final results. Jama, 270(6), pp.713-724.
Nsiah-Asamoah, C., Setorglo, J. and Mie, J.B., 2017. Nutritional Counseling for Hypertensive Patients: Have Final-Year Nursing Students Learnt Enough to Be Able to Offer Advice to Such Patients?. Journal of Biomedical Education, 2017.
Opie LH, Seedat YK. Hypertension in sub-Saharan African populations. Circulation 2005; 112(23): 3562–3568.

Parker, M., Puddey, I.B., Beilin, L.J. and Vandongen, R., 1990. Two-way factorial study of alcohol and salt restriction in treated hypertensive men. Hypertension, 16(4), pp.398-406.
Pickering, T., 1996. Recommendations for the use of home (self) and ambulatory blood pressure monitoring. American Journal of Hypertension, 9(1), pp.1-11.

Potter, J.F. and Beevers, D.G., 1984. Pressor effect of alcohol in hypertension. The Lancet, 323(8369), pp.119-122.

Ryan, T.J., Anderson, J.L., Antman, E.M., Braniff, B.A., Brooks, N.H., Califf, R.M., Hillis, L.D., Hiratzka, L.F., Rapaport, E., Riegel, B.J. and Russell, R.O., 1996. ACC/AHA guidelines for the management of patients with acute myocardial infarction: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee on Management of Acute Myocardial Infarction). Journal of the American College of Cardiology, 28(5), pp.1328-1419.

Schnall, P.L., Schwartz, J.E., Landsbergis, P.A., Warren, K. and Pickering, T.G., 1992. Relation between job strain, alcohol, and ambulatory blood pressure. Hypertension, 19(5), pp.488-494.
Trilling, J.S. and Froom, J., 2000. The urgent need to improve hypertension care. Archives of Family Medicine, 9(9), pp.794-801.

Whelton, S.P., Chin, A., Xin, X. and He, J., 2002. Effect of aerobic exercise on blood pressure: a meta-analysis of randomized, controlled trials. In Database of Abstracts of Reviews of Effects (DARE): Quality-assessed Reviews [Internet]. Centre for Reviews and Dissemination (UK).
Xin, X., He, J., Frontini, M.G., Ogden, L.G., Motsamai, O.I. and Whelton, P.K., 2001. Effects of alcohol reduction on blood pressure: a meta-analysis of randomized controlled trials. Hypertension, 38(5), pp.1112-1117.1065.

Kelly AS , Barlow SE , Rao G , et al . Severe obesity in children and adolescents: identification, associated health risks, and treatment approaches: a scientific statement from the American Heart Association. Circulation 2013;128:1689–712.doi:10.1161/CIR.0b013e3182a5cfb3. Khoury PR, Zeitler P. Increased incidence of non-insulin dependent diabetes mellitus among adolescents. J Pediatr. 1996; 128:608–15.

Public Health Nutrition, 1-8. Ministry of Health. (2006). Botswana National Health School Health Policy and Procedure Manual. Gaborone, Botswana: Government Printers.

Methven E, Mcdowell ZC, Hacking B, Alexander D, Stewart L et al. Health consequences of obesity. Arch Dis Child 2003; 88:748– 52. doi:10.1136/adc.88.9.748. 51 | P a g e
Rolland-Cachera MF, Deheeger M, Maillot M, et al. Early adiposity rebound: causes and consequences for obesity in children and adults. Int J Obes. 2006;30:S11–S17.

A Systematic Review of the Role of Physiotherapy Interventions in Palliative Care

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Abstract

The aim of this research is to conduct a systematic review analysing the role of the physiotherapy interventions in palliative care. PRISMA as a critical appraisal tool was utilised for the selection of the research articles. The inclusion criteria were based on the year of publication, ease of availability, language, geographical location, and study type. To ensure the credibility, databases such as Elsevier, Proquest, and EBSCO Host were used to filter the grey content. Data published in the past ten years (2009-onwards) was only included to ensure the selection of the most recent interventions used by the physiotherapists. A total of 11 articles were selected which determined that physiotherapy interventions involving breathing exercises, aerobic exercises, manual therapies, and educational awareness were critical to promoting the functional capability and empower the patients.

Keywords: Physiotherapist, Palliative Care, Physical Therapy, End-of-Life Care, Non-pharmacological Intervention

Background

World Health Organisation (WHO) defined palliative care as the approach which enhances the quality of life of the patients who are encountered with life-threatening diseases through the management and relief from the suffering through early intervention, impeccable evaluation, and treatment of pain and other associated issues [1]. Patients in palliative care experience a greater level of functional incapability and disability as a result of disease progression, direct local and systematic impacts, and deconditioning pain. Impairment in physical functioning is a predominant contributor to a significant decline in the quality of life of such patients. Palliative care patients expressed a high desire to stay physically active during the course of the disease while sustaining and retaining physical independence [2]. Thus, the notion of rehabilitation in palliative care Spatients is to promote adequate treatment provided with the objective to eradicate disability through optimising the functional status, independence, autonomy, and standard of living.

The World Confederation for the Physical Therapy has defined physical therapy or physiotherapy as the provision of services to the people for the development, maintaining, and restoring the maximum mobility as well as functional capability throughout the entire life-span [3]. Physiotherapy, in particular, encompasses the services in situations where the function and the movement are threatened by the ageing process or due to any injury/disease [4]. Physiotherapists form an integral component of the multidisciplinary team (MDT) in the palliative care by focusing on the processes and procedures for enhancing the function and quality of life through multivariate care dimensions [5]. Of these care dimensions, the physical dimension in the palliative care treatment and management is linked to symptom control, improving the flexibility, mobility, endurance, deformity, gait, balance, co-ordination, deformity, energy expenditure, and exercise tolerance along with maintaining adequate breathing. The functional dimensions, on the other hand, are related to improving the daily activities and functions that include the sensorimotor performance [6]. Physiotherapists aim to improve the successful performance of the complicated physical functional activities such as housekeeping and maintaining personal hygiene which requires the involvement of the affective and cognitive abilities.

The integration of physiotherapists into the palliative care plan is a relatively new concept despite the fact that the physiotherapy interventions in palliative management were identified during the early 1960s [1]. The primary objective of including a rehabilitation approach while treating the palliative care patients is through goal setting to enhance the functional ability while subsequently reducing the disease consequences as long as possible [7]. The ultimate goal of the physiotherapist is to promote independence as much as possible to ensure the accomplishment of important activities to ease the end-stage life of the people. However, in cases where improving the functional ability is not possible, physiotherapy intervention is to promote the patient as well as the ability of the carer to cope with the deteriorating condition of the patient through awareness and education to improve the quality of life [8]. Therefore, the overall aim of the physiotherapist is to facilitate the patient to reach the best possible quality of living for the remaining patient's life.

Methodology

Research Design

The research design for this study has been based on the systematic review of the literature to determine the interventions of physiotherapists in palliative care. Through a systematic review, the selection of the appropriate data sources enabled the researcher in collecting pertinent, credible, and reliable information through the use of databases for the selection of peer-reviewed journal articles [9]. Provided the nature and phenomenon of the research topic, systematic qualitative review of literature is optimal as it enables in determining the interventions of physiotherapists from previous authenticated researches without the involvement of any statistical testing as no variables are involved in this research.

Search Strategy

The search strategy for the attainment of the most desirable information comprised on the use of the keywords "Physiotherapy", "Physiotherapist" "Physiotherapy interventions", and "Palliative care" alone as well as in combination with the utilisation of the Boolean Operators "AND" and "OR". The Boolean Operators were incorporated into the search strategy of the most reliable, authenticated, and prominent databases in the field of health sciences which included Elsevier, ProQuest and EBSCO Host. Here, it is important to signify that the entire research was constituted using the widely used and openly accessed databases to ensure the reproducibility and credibility of the literature.

Data Extraction

The criterion for the extraction of data was based on the inclusion versus the exclusion criteria. The inclusion criteria facilitate in setting the boundaries and restrictions for collecting the most viable, authenticated, and reliable information [10]. Different approaches for the inclusion criteria which had been specified for this research included the language, publication year, study type, geographical aspects, design of the research, and the interest exposure. In the regard, through the use of the inclusion criteria, the researches which had been published in the English language only were opted while literature in a language other than English was excluded. In a similar manner, the research studies which had been published in the last ten years were selected for this study to ensure the inclusion of the most updated and relevant context. Thus, literature published before 2009 was excluded from the selection.

Selection of the Study

The selection of the study in the systematic approach is regarded as the critical appraisal which ensures the value and trustworthiness of the study. Critical appraisal is commonly regarded as the implications of the values and rules that predominantly assist in the evaluation of the resulting viability, method, and procedures while adhering to the ethics. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) are used for the assessment of the critical appraisal tool for determining the validity and reliability of the data collection [11]. PRISMA promotes in easy filtration of the research articles to comply with the standards of the quality. Thestep-by-step assessment of the PRISMA to determine the physiotherapy intervention in palliative care is illustrated in the following figure below [5]

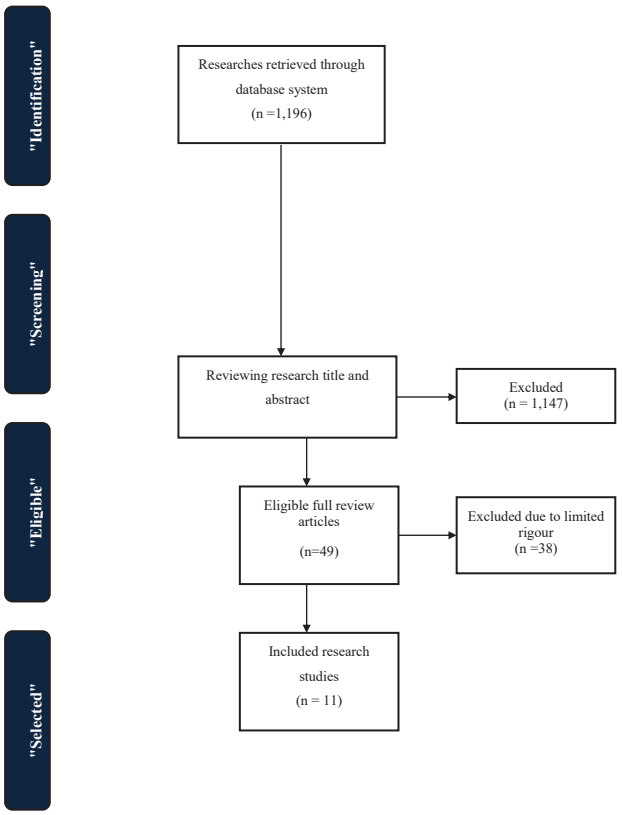
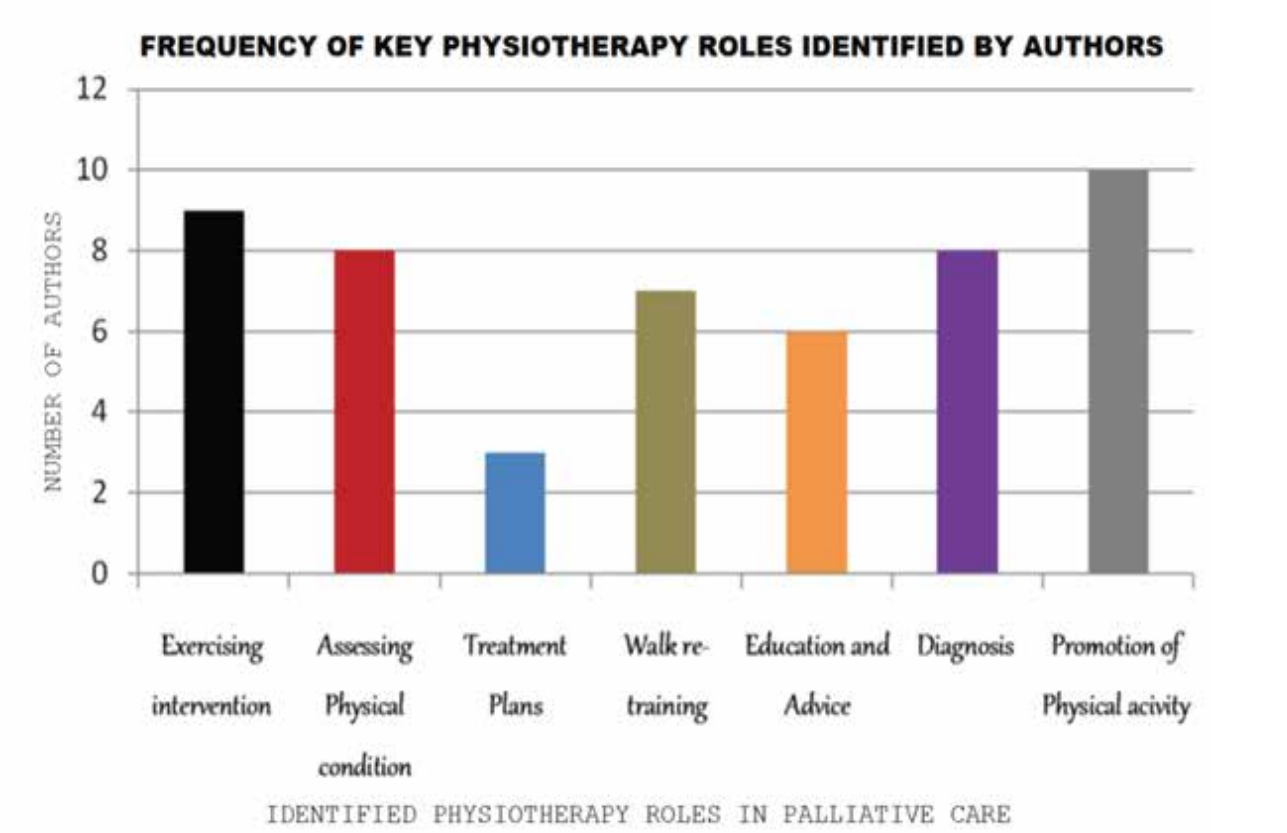


Fig 1l PRISMA Flow Diagram

Author	Year	Country	Methodology	Key Findings
Hegarty et al.	2016	Ireland	Cross-sectional Study	The key findings indicated that physiotherapy induced palliative exercising interventions in patients suffering from Parkinson's disease improved the strength of the lower limbs. The physiotherapist intervention specifically deduced that palliative exercising could serve as a potential modification for the accomplishment of clinically relevant results in the walking ability of the patients.
Lim and Ng	2015	Singapore	Mixed methodology	It was determined that improving the knowledge and skills of the physiotherapists through perception and knowledge in the palliative care domain could predominantly assist in analysing the challenges in acute hospital settings. Good palliative care is dependent on effective communication, education and advice, so physiotherapist intervention is based on developing communication skills to improve technical competencies.
Möller et al.	2016	Sweden	Pilot Study	Physiotherapist interventions in palliative care settings were determined through multiple therapeutic mechanisms focused on patient-centric needs, good diagnosis, promotion of physical activity, treatment plans. The pilot study determined that a better-nuanced investigation of the clinical complications could facilitate in the optimisation, clarification, and development of physiotherapy interventions.
Jensen et al.	2014	Germany	Retrospective, Descriptive Study	The key analysis indicated that physical exercise in advanced cancer patients had a beneficial impact on the mobility and functional ability with respect to the disease-related and socio-demographic aspects. Physiotherapeutic intervention including the relaxation and the breathing therapies improved the quality of living of terminally ill patients.
Przedborska et al.	2015	Poland	Quantitative Method	The findings indicated that though physiotherapy interventions did not exhibit a statistically significant relationship in enhancing the self-care and mobility of the

				patients in palliative care, however, prominent results were recorded in the management of the depression, anxiety, and intensity of dyspnea after the physiotherapy program. Walk retraining, education and advice on health as well promotion of physical activity.
Morrow et al.	2017	South Africa	Cross-sectional Descriptive Survey	Despite inadequate training, knowledge, and required skillsets, a large number of physiotherapists were able to manage the critical requirements of the patients during palliative care and thus proper inclusion of the palliative care knowledge in the graduate program could yield better and positive outcomes for optimising the individual functional capability.
Saher et al.	2018	India	Randomised Clinical Trial Retrospective Study	The final outcomes indicated that physiotherapists led interventions improved the functional capability while offering relief from the symptoms to the patients in palliative care. This signified the notion that physiotherapists in caring of patients could enhance the independence and quality of living during end-stage of life.
Cullum	2019	United Kingdom	Qualitative Semi-structured Interviews	Within the inpatient settings, rehabilitative palliative care has become a challenge for the inpatient hospice unit and physiotherapist could play an integral role in eradicating the barriers through effective communication and rehabilitative palliative care practices while improving the confidence and autonomy of the patients.
Wilson and Briggs	2017	United States of America	Review Article	Lack of the consistent integration of the physiotherapist within the hospital settings is constituted as a barrier in the provision of non-opioid alternatives for the management during the palliative care. Physical therapy supports pain management by improving the quality of life and reducing the dependency on opioid medication.
Pullen et al.	2014	Nigeria	Case Study Analysis	The key analysis interpreted a complete eradication of the shortness of breath (SOB) upon exertion and relief from pain due to the physiotherapy sessions. In addition, a prominent reduction was also observed in muscle endurance, strength, and resting heart rate. Hence, the physiotherapy interventions comprising of

				manual therapy and exercise were beneficial as an adjunct therapy.
Pyszora et al.	2017	Poland	Randomised Clinical Trial	Exercising program design led to a prominent decrease in the fatigue scores within the palliative care which positively influenced the day-to-day functioning. These findings led to the belief that physiotherapy is regarded as an effective and safe method in cancer-related fatigue to improve the quality of living.



Discussion

The data analysis has offered a comprehensive evaluation highlighting the contemporary role of the physiotherapist interventions in the treatment and management of palliative care, among key roles frequently identified was promotion of physical activity, exercise intervention, diagnosis and assessing physical condition, walk-retraining, education and advice and developing treatment plans in line with client need as well as involvement. Palliative care is regarded as a holistic practice which involves caring of the people living with life-threatening illnesses or individuals during the end stage of the lives. Though pharmacological interventions are the primary source to manage and treat the palliative care measures, exercise and the physical activity acts as a secondary mechanism to improve the quality of living thereby acting as a cornerstone to the non-pharmacological management [12]. In this context, a physiotherapist led palliative exercise programme (PEP-PD) was designed which was executed for a total of six weeks duration constituting of portable ankle weights. The outcomes of the study clearly signified that a progressive six-week physical therapy improved the muscle strength and intensity of the lower limbs in patients living with Parkinson's disease (PD).

Nonetheless, the improvement in the flexibility and strength did not incur any difference in the severity of the patient condition. Similarly, physiotherapy leads to the maximisation of mobility, independence, and mobility provided adequate treatment and monitoring [13]. In this regard, improving the attitude, knowledge, experience, and beliefs of the physiotherapists to improve the standard and quality of life for the patients in palliative care is important [14]. Hence, physiotherapy-led interventions are integral in promoting individual autonomy, independence, mobility, and body functioning during the end of life care.

Other physiotherapy interventions included the strengthening exercises offered to patients determined that physiotherapy has a positive and direct relationship in improving the patient outcomes and perceived well-being in populations demanding palliative care [15, 21].

Despite the fact that the profession has been under-valued and underestimated across the globe, there is a growing impetus for the improved physiotherapist's interventions and involvements in the in-patient as well as outpatient settings to offer relief from symptom and pain through non-pharmacological interventions. Specific physiotherapy interventions included breathing/aerobic exercises which are beneficial and recommended during the advanced disease progression to offer timely relief to the patients. Physiotherapy leads to a significant reduction in the rate of fatigue in patients receiving palliative care [16, 24].

Physiotherapy interventions are beneficial in the symptom management and alleviation of troublesome pain and discomfort through increased mobility and focusing on physical activity. Additionally, physiotherapy interventions in advanced diseases play a crucial role in improving the overall state of well-being of the patient while subsequently limiting the severity of the comorbid symptoms [17]. Hence, aerobic exercising, awareness, education, and alteration in the breathing mechanisms through physiotherapy interventions could play a positive role in improving the general state of the patients receiving palliative care.

Another physiotherapy intervention is based on generating awareness and improving the educational needs of the patients and the carers. Lim and Ng focused on the effectiveness and importance of the educational needs of the physiotherapists in the domain of palliative care [18, 23]. A lack of confidence and knowledge could lead to a negative influence on the quality of care services thereby affecting the patient well-being receiving palliative care. As opposed, good palliative care is highly dependent on effective communication skills as well as the technical competencies of the physiotherapists. In addition, multivariate role of the physiotherapists is involved in the specialised palliative care through prioritising the patient needs and addressing the emergent issues which directly hamper in the sudden alterations in the health status of the patients [19]. Therefore, educating the patient and creating awareness among the caregivers is also identified as a critical intervention through which the quality of life and well-being of the patients receiving palliative care could be addressed.

Along with educating the patients, education and development of the skillset of the physiotherapists are equally important in developing effective communication and interpersonal therapeutic relationships to provide ease and independence during the last stages of life.

Kumar and Jim (2010) discussed different physical therapy techniques and interventions comprising of therapeutic exercise, electrical modalities, thermal modalities, additional physical agents, and miscellaneous modalities (manual therapies) which offer an inherent role in improving the functional ability and care dimensions during the palliative care. The therapeutic exercises constituted of assisted active movement for offering relaxation, stabilisation, and mobilisation.

Electrical modalities, on the other hand, included the neuromuscular electrical stimulation which has been regarded as useful specifically in pain relief and management. Thermal modalities included the utilisation of heating and cold packs to promote flexibility. Physiotherapists play integral part in the multidisciplinary team involved with patients receiving palliative care [20]. This is done through physical therapy interventions which improve flexibility, muscle strength, durability, and functional mobility, as well as through optimising the respiratory, circulatory, cardiac, and muscular functioning to control pain and improve the functional independence [22]. Thus, physical therapy in palliative care patients is significant in promoting physical strength and independence.

Conclusion

The aim of this research study was to evaluate the role of the physiotherapist intervention in palliative care through critical analysis of the past literature. This systematic review of literature facilitated in analysing different intervention techniques which are globally utilised by physiotherapists for improving the quality of life during the end-stage of the patients. The analysis of the 11 research articles published in a period of ten years (2009 onwards) has identified multivariate intervention techniques which are adopted by the physiotherapists to enhance the general well-being through functional mobility, independence, and educational awareness. The findings also emphasised on the active role of the physiotherapists in pain relief and improvement in the symptoms through non-pharmacological techniques which lead to better outcomes for the patients. Hence, it is subjugated that involvement of the physiotherapists in the multidisciplinary team designed for patients receiving palliative care is essential in improving the physical strength, independence, and autonomy of the patients through optimised control mechanisms.

References

1. Saher, T.; Kalra, S.; Yadav, J.; Thariwal, S.; Yadav, K.; Tanwar, P. Role and importance of Physiotherapy during Palliative Care in India: A Review. World Journal of Research and Review 2018, 7(4), 01-08.
2. Montagnini, M.; Lodhi, M.; Born, W. The Utilization of Physical Therapy in a Palliative Care Unit. Journal of Palliative Medicine 2003, 6 (1), 11–17, doi:10.1089/10966210360510073.
3. What is physical therapy. https://www.wcpt.org/what-is-physical-therapy (accessed Apr 22, 2020).
4. Kumar, S.; Jim, A. Physical Therapy in Palliative Care: From Symptom Control to Quality of Life: A Critical Review. Indian Journal of Palliative Care 2010, 16 (3), 174, doi:10.4103/0973-1075.73670.
5. Guide to Physical Therapist Practice. Physical Therapy 2001, 81 (1), 9.
6. Jette, A. M. Physical Disablement Concepts for Physical Therapy Research and Practice. Physical Therapy 2010, 74 (5), 380–386, doi: 10.1093/ptj/74.5.380.
7. Marcant, D.; Rapin, C.-H. Role of the Physiotherapist in Palliative Care. Journal of Pain and Symptom Management 1993, 8 (2), 68–71, doi:10.1016/0885-3924(93)90102-2.
8. Peter, M.; Ann, C.; Sam, P.; Jacqui, S.; Dai, R.; Andrew, L.; Chris, T.; Ann, C. Complementary Therapists Motivation to Work in Cancer/Supportive and Palliative Care: A Multi-Centre Case Study. Complementary Therapies in Clinical Practice 2009, 15 (3), 161–165, doi:10.1016/j.ctcp.2009.03.004.
9. Jackson, S. L. Research methods and statistics a critical thinking approach; Wadsworth Cengage Learning: Australia, 2016.
10. Salkind, N. J. Encyclopedia of research design; SAGE reference: Los Angeles, 2010.
11. Linsley, P.; Kane, R.; Barker, J.H. Evidence-based practice for nurses and healthcare professionals; Sage Publications: S.l., 2019.
12. Hegarty, D.; Galvin, R.; McGirr, L.; Cahill, F.; McQuillan, R.. Physiotherapy led palliative exercise programme for people with advanced Parkinson's disease (PEP-PD): A feasibility study. Physiotherapy Practice and Research, 2015, 37(1), 31-39, doi:10.3233/p-pr-150070.
13. Tomlinson, C. L.; Herd, C.P.; Clarke, C.E.; Meek, C.; Patel, S.; Stowe, R.; Deane, K.H.; Shah, L.; Sackley, C.M.; Wheatley, K.; Ives, N. Physiotherapy for Parkinson's disease: a comparison of techniques. Cochrane Database of Systematic Reviews 2014, (6).
14. Morrow, B. M.; Barnard, C.; Luhlaza, Z.; Naidoo, K.; Pitt, S. Knowledge, Attitudes, Beliefs and Experience of Palliative Care amongst South African Physiotherapists. South African Journal of Physiotherapy 2017, 73 (1), doi:10.4102/sajp.v73i1.384.
15. Jensen, W.; Bialy, L.; Ketels, G.; Baumann, F. T.; Bokemeyer, C.; Oechsle, K. Physical Exercise and Therapy in Terminally Ill Cancer Patients: a Retrospective Feasibility Analysis. Supportive Care in Cancer 2013, 22 (5), 1261–1268, doi:10.1007/s00520-013-2080-4.
16. Przedborska, A.; Misztal, M.; Wroński, M.; Gruziel, D.; Świątczak, M.; Ciałkowska-Rysz, A. Raczkowski, J.W. The effect of physiotherapy on the condition of cancer patients receiving palliative care. Medycyna Paliatywna/Palliative Medicine 2016. 8(2), 68-74.
17. Kaur, D.; Kumar, G.; Billore, N.; Singh, A. Defining the Role of Physiotherapy in Palliative Care in Multiple Sclerosis. Indian Journal of Palliative Care 2016, 22 (2), 176, doi:10.4103/0973-1075.179599.
18. Lim, J.; Ng, K. Educational Needs of Physiotherapists in the Area of Palliative Care: a Multi-Centre Study in Singapore. Physiotherapy 2015, 101, e875–e876, doi:10.1016/j.physio.2015.03.1704.
19. Möller, U. O.; Malmström, M.; Beck, I.; Rasmussen, B. The Variability of Physiotherapeutic Interventions in Specialized Palliative Care. Physiotherapy 2016, 102, e92–e93, doi:10.1016/j.physio.2016.10.094.
20. Laakso, L. The role of physiotherapy in palliative care. Australian family physician, 2006. 35(10), 781.
21. Wilson, C. M.; Briggs, R. Physical Therapys Role in Opioid Use and Management During Palliative and Hospice Care. Physical Therapy 2017, 98 (2), 83–85, doi:10.1093/ptj/pzx108.
22. Pyszora, A.; Budzyński, J.; Wójcik, A.; Prokop, A.; Krajnik, M. Physiotherapy Programme Reduces Fatigue in Patients with Advanced Cancer Receiving Palliative Care: Randomized Controlled Trial. Supportive Care in Cancer 2017, 25 (9), 2899–2908, doi:10.1007/s00520-017-3742-4.
23. Pullen, S.; Chigbo, N.; Chukwudi, N. E.; Chim, A. C.; Chinwe, C.; Chukwunoso, I. S. Physiotherapy Intervention as a Complementary Treatment for People Living with HIV/AIDS. HIV/AIDS - Research and Palliative Care 2014, 99, doi:10.2147/hiv.s62121.
24. Cullum, S. Rehabilitative Palliative Care - a Challenge on the Hospice Inpatient Unit? Physiotherapy 2019, 105, e167–e168, doi:10.1016/j.physio.2018.11.172.

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2021 Calendar

DDT COLLEGE OF MEDICINE

January

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DDT COM ACADEMIC DATES

12th-13th	January	Supplementary Exams
13th-14th	May	Registration
26th-27th	August	Registration
14th-15th	January	Registration
17th	May	Classes begin
30th	August	Classes begin
18th	January	Classes Begin
31st	May-3rd June	QUIZ 1
13th-17th	September	QUIZ 1
1st-4th	february	QUIZ 1
21st-25th	June	Midterm Exam
11th-15th	November	Midterm Exam
1st-4th	March	Mid term Exam
12th-16th	July	QUIZ 2
18th	November	Graduation
22nd -26th	March	Quiz 2
09th-13th	August	Final Exam
1st-5th	November	QUIZ 2
26th-30th	April	Final Exam
16th-20th	August	Orientation
29th	Nov-3rd Dec	Final Exam
20th	Decembe	College closes

BOTSWANA PUBLIC HOLIDAYS

Jan 01st	New Year's Day
Jan 2nd	New year Holiday Day
Feb 14th	Valentine's Day
Apr 10th	Good Friday
Apr 13nd	Easter Monday
May 1st	Labor Day
May 21st	Ascension Day
Jul 1	Sir Seretse Khama Day Holiday
Jul 20th	President Day
Jul 21st	President Day
Sep 30th	Independence Day
Oct 1st	Holiday
Dec 25th	Christmas
Dec 26th	Boxing day

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January

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

February

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
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28						

March

S	M	T	W	T	F	S
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April

S	M	T	W	T	F	S
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May

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June

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July

S	M	T	W	T	F	S
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18	19	20	21	22	23	24
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August

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
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29	30	31				

September

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
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October

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					1	2
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24	25	26	27	28	29	30
31						

November

S	M	T	W	T	F	S
	1	2	3	4	5	6
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December

S	M	T	W	T	F	S
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26	27	28	29	30	31	

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