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Counting Tuberculosis Patients in India: A Continued Imbroglio?

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In India, tuberculosis continues to be major public health problem despite the efforts of the Revised National Tuberculosis Control Programme (RNTCP) since 1997. In 2014, out of the estimated 9.6 million TB cases across the globe, India alone harbors nearly 23% (2.2 million TB cases) of the total global TB burden.¹

Globally, estimating the TB incidence in the countries has always been difficult and challenging. Measuring TB incidence at a National level was never possible because it involves large number of patients in a cohort for long duration and involves huge costs for logistics.² The World Health Organization (WHO) publishes the Global Tuberculosis report every year which includes the TB incidence, prevalence, mortality and other indicators of all the countries. The following methods were used to estimate the TB incidence in the countries. (a) Case notification data combined with expert opinion about case detection gaps (b) Results of National Prevalence Surveys (c) Notification in high income countries adjusted by standard factors to account under-diagnosis and under-reporting (d) Results from capture and re-capture studies.¹

The Government of India did not accord its official approval for the TB incidence estimates provided in the WHO global tuberculosis report 2013.² Probably, the national experts were not convinced with the “onion model” which used the experts opinion to estimate the missed and the under reported cases. Hence, the TB incidence figures for that year were considered provisional.

In May 2012, the Government of India made TB notification mandatory to notify the TB disease either diagnosed at public or private health systems. Till that time, only TB cases diagnosed at public health facilities were notified while the cases notified from the private health sector was minimal.³ The TB notification initiative was undertaken mainly because it serves as a proxy indicator for the TB incidence which includes the TB cases diagnosed at both public and private health sector. In India, the private health sector is huge, fragmented and complex; the TB patient notification from the private health sector is catching up slowly over the years and the programme is optimistic about complete participation of private sector in the coming years. To make it a reality, the programme has to invest substantial amount of money, time and human resources to implement effective strategies and set up mechanisms for smooth functioning.

The recent studies conducted to understand the quantum of TB patients in private sector based on anti-TB drug sales in India has shown that private-sector tuberculosis burden is 2.2 million cases (1.2-5.3 million) which is more than twice the burden suggested by previous assumptions.⁴ This is an alarming situation for the country and the health system has to be geared up immediately to tackle the TB menace.

To conclude, with whatever dilemma that exists in methods of TB burden estimates for India, it is imperative the country has to take bolder steps in order to meet the End TB Strategy.⁵

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REFERENCES

1. WHO. Global tuberculosis report 2015. Geneva; 2016. Web site. http://apps.who.int/iris/bitstream/10665/191102/1/9789241565059_eng.pdf?ua=1. Accessed August 29, 2016
2. WHO. Global tuberculosis report 2013. Geneva; 2014. Web site. http://apps.who.int/iris/bitstream/10665/91355/1/9789241564656_eng.pdf. Accessed August 29, 2016
3. Nagaraja SB, Achanta S, Kumar AM V, Satyanarayana S. Extending tuberculosis notification to the private sector in India: Programmatic challenges? *Int J Tuberc Lung Dis*. 2014; 18(11):1353-1356. doi: [10.5588/ijtld.13.0836](https://doi.org/10.5588/ijtld.13.0836)
4. Arinaminpathy N, Batra D, Khaparde S, et al. The number of privately treated tuberculosis cases in India: An estimation from drug sales data. *Lancet Infect Dis*. 2016; 3099(16): 1-6. doi: [10.1016/S1473-3099\(16\)30259-6](https://doi.org/10.1016/S1473-3099(16)30259-6)
5. World Health Organization. WHO | WHO End TB Strategy. 2015; Web site. http://www.who.int/tb/post2015_strategy/en/. Accessed August 29, 2016

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Road Traffic Accidents as Public Health Challenge in the Gulf Cooperation Council (GCC) Region

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Road traffic accidents continue to be a major cause of death and disability, globally, causing about 1.25 million deaths annually since 2007.¹ Not only are road traffic accidents among the leading causes of deaths among the age cohorts between 5 and 44 years, but also the economic effects of vehicular accidents are estimated to be in excess of \$500 billion US.² The magnitude and persistence of this public health challenge has been recognized by public health researchers, policy makers and advocates at the global level, resulting in a resolution passed by the UN General Assembly to give priority to road safety by declaring the Decade of Action for Road Safety, 2011-2020. Member states were required to implement plans to improve road safety by taking various measures at the national and local levels and report data to show progress toward the goals established. The WHO was enlisted to monitor progress on a National and Regional level, issuing global status reports on the effects of policy changes implemented. The importance of this initiative was reinforced by the inclusion of two road safety goals among the 17 established in the post-2015 Global Sustainable Development Goals agenda: to decrease by 50% the number of deaths and injuries from road traffic accidents globally by 2020; and “to provide safe, affordable, accessible and sustainable transport systems for all [by] improving road safety.”³ Although low- and middle-income nations account for 54% of the registered motor vehicles globally, they represent 90% of the roads traffic fatalities. Of the 68 nations that have experienced increases in road traffic fatalities since 2010, 84% are low and middle-income. The WHO Eastern Mediterranean Region is second only to the African Region in the road fatality rate per 100,000, 26.6 and 19.9, respectively. The Eastern Mediterranean Region is unique in that the high-income nations within this region have higher fatality rates than their less wealthy neighbors. The fatality rate experienced by this population of 22.4 per 100,000 populations far exceeds the global average rates for the high income nations of 9.2 per 100,000. This alone may justify giving special attention to this Region in addition to its increasing global importance economically and politically. As expressed in the Global Status Report on Road Safety 2015 in the higher-income nations in this Region, “rapid economic development that has resulted in increased motorization and road infrastructure construction has not been accompanied by sufficient investment in institutional capacity, nor in the interventions needed to cope with these changes”¹ to effectively enhance and sustain road safety in the face of a young and rapidly expanding population. Road traffic accidents were the leading cause of death to people in the 15 to 29-year age cohort in 2012 (loc. cit. xi), with the associated adverse implications for families due to psychological and economic loss and the loss of social capital from the national perspective.

The WHO estimated road traffic fatalities for the GCC nations for 2013 and the death rates per 100,000 population and registered vehicles are as follows along with comparison data for the US and the United Kingdom (Table 1).

All the GCC nations are categorized as high-income based on the World Bank criteria and each except Bahrain presents a road traffic accident fatality rate above the mean for all high-income nations of 9.2 per 100,000. Only Saudi Arabia and Oman show higher road fatality rates in 2013 than the mean rate of 19.9 for the WHO Eastern Mediterranean Region,

Nation	Deaths/100,000	# Registered Vehicles	Deaths/100,000 RV
Bahrain	8.0	545,155	19.6
United Arab Emirates	10.9	2,674,894	38.2
Qatar	15.2	647,878	50.9
Kuwait	18.7	1,841,416	34.2
Oman	25.4	1,082,996	85.3
Saudi Arabia	27.4	6,599,216 ¹	119.7
United Kingdom	2.9	35,582,650	5.1
United States	10.6	265,043,362	12.9

Table 1: Comparative national road traffic fatalities, 2013.¹

while those two nations and Kuwait exceed the world-wide fatality rate of 17.4 per 100,000 for that year. It should be noted that as reported by the WHO, road traffic fatalities per 100,000 among these nations have shown a decreasing trend from 2004 to 2013 with the exceptions of Kuwait and Saudi Arabia.

As an important component of its Global Plan for Road Safety, 2011-2020, the UN and WHO included the encouragement and reporting of legislative and regulatory efforts to modify drivers' and passengers' behavior to enhance road safety. The key elements include national speed limits, drink-driving, motorcycle helmet, seat-belt, child restraint, drug-influenced driving and mobile phone use (distracted driving) laws. Seat-belt use alone by drivers and front seat passengers decreases the risk of fatal injuries by 45%-50% and serious injuries by 45%.⁴ According to the data reported in the 2015 Global Status Report all six GCC nations reported the existence of national legislation in all these areas except child restraint legislation which was reported only for Bahrain, Oman, and Saudi Arabia. Obviously, prevailing legislation does not necessarily entail effective enforcement. Within this Region traffic safety enforcement is considered to be at best inconsistently and perhaps unfairly enforced with preferential treatment shown to its nationals and the politically connected.

Given the statutory foundation requiring the use of seat belts and child restraints in passenger vehicles and the clear evidence that such measures reduce fatalities and severe injuries in road traffic accidents, both stricter enforcement of existing traffic safety regulations requiring these protections and more effective health and safety education focused on these preventive measures should be given immediate and ongoing priority. Inaction and inconsistent enforcement of existing regulations in addressing this threat to the public's health in the GCC nations especially and throughout the MENA Region will entail continuing tragedy for individuals and families directly affected and economic costs on a national basis. That the younger age cohort of 18-24 years, who represent an important pool of future leaders and professionals, is most vulnerable to road traffic accident deaths and disability represents a devastating but preventable drain of social capital for each nation affected.

DISCLOSURE

Unless otherwise cited, the data referenced in this article is taken from the WHO Global Status Report on Road Safety 2015.

REFERENCES

1. World Health Organization. Global Status Report on Road Safety 2015. Web site. http://www.who.int/violence_injury_prevention/road_safety_status/2015/GSRRS2015_Summary_EN_final.pdf. Accessed August 29, 2016
2. United Nations, Global Plan for the Decade of Action for Road Safety 2011-2020. Web site. http://www.who.int/roadsafety/decade_of_action/plan/en/. Accessed August 29, 2016
3. The Global Goals. 2015. Web site. <http://www.globalgoals.org/>. Accessed August 29, 2016
4. Elvik R, Vaa T, Erke A. *The Handbook of Road Safety Measures*. 2nd ed. Bingley, UK: Emerald Group Publishing Ltd; 2009.

Brief Research Report

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Why do Organizations Focus on Health Equity in their Childhood Obesity Policy Work?

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ABSTRACT

Introduction: Childhood obesity disparities exist, yet little is known about why organizations focus on health equity (i.e., the absence of systematic disparities in health) when working in this area.

Methods: From September 2014 to April 2015, we interviewed 43 policy-makers, non-governmental organization representatives, and academics to explore why organizations focus on health equity within their childhood obesity policy work.

Results: Key themes included: organizational mission/focus on health equity, funders' requirements to prioritize health equity, and community engagement coupled with data availability to support their interest in health equity.

Conclusions: Funders and other childhood obesity stakeholders can capitalize on these findings to facilitate activities that address health equity.

KEYWORDS: Childhood obesity; Health disparities; Health equity; Public health practice; Health policy; Community-based organizations.

ABBREVIATIONS: NGO: Non-Governmental Organization; AHA: American Heart Association; RWJF: Robert Wood Johnson Foundation; IOM: Institute of Medicine; CDC: Centers for Disease Control and Prevention.

INTRODUCTION

Obesity affects nearly one in five US children, increasing their likelihood of developing chronic diseases.¹⁻⁵ The Institute of Medicine (IOM), Centers for Disease Control and Prevention (CDC), and academic researchers have recognized that socio-economic, racial, and ethnic disparities exist relative to childhood obesity.⁶⁻¹¹ To address this, advocates and policy-makers should consider health equity and the differential impacts that a childhood obesity policy may have.

Equity (also known as human equity) is the absence of avoidable or preventable differences between groups with varying levels of social advantage/disadvantage (i.e., wealth, power, prestige).¹² Health equity falls under this broader umbrella and refers to the absence of systematic differences in social conditions or other modifiable determinants of health between more and less advantaged social groups.¹³ Despite the importance of promoting equity, and health equity in particular, many policies that address childhood obesity fail to explicitly consider health equity. In fact, Bleich et al¹⁴ recently found that from 2012-2013, among state-level bills related to childhood obesity, only one-third focused on health equity. For example, a community's policy to improve walkability may enhance parks and other walking spaces situated in higher but not lower income neighborhoods. In doing so, the policy allows children in higher income neighborhoods to benefit from these improvements while those in lower income neighborhoods do not. On the other hand, childhood obesity prevention policies that explic-

itly consider health equity are more likely to help all children achieve their full potential. For example, a policy designed to improve access to primary care and health promotion services for children at high risk of developing obesity ensures that those most in need of specific health services receive them. These two contrasting examples raise several important points: 1) while childhood obesity prevention inherently involves health equity, policies to address this public health challenge do not always account for health disparities; 2) well-intentioned policies (e.g., to improve walkability) may further entrench a community's health disparities if they fail to account for health equity; and 3) not all stakeholders in the policy-making process will prioritize health equity concerns (e.g., some stakeholders will want to improve walkability in specific neighborhoods to encourage tourism).

In light of this, it is important to understand what drives organizations to focus on health equity when working in the area of childhood obesity. By learning why some groups prioritize health equity and others do not, we can gain insights about how to incentivize the inclusion of health equity concerns in the policy-making process. Due to the rapid proliferation of policies to address childhood obesity, this information is critical to inform current policy formulation and implementation debates. To answer this question, we interviewed policy-makers, non-governmental organization (NGO) representatives, and academics to explore factors that lead these groups to focus on health equity when working in the area of childhood obesity policy.

MATERIALS AND METHODS

Using a semi-structured format, we interviewed policy-makers, representatives of NGOs, and academics to explore why organizations focus on health equity within their childhood obesity work. Academic interviewees worked in college or university settings and conducted research about childhood obesity. NGO interviewees worked for non-profit groups and had some personal experience with childhood obesity-related policies. Policy-maker interviewees worked in state or local legislatures or administrative agencies and had previously worked on issues related to childhood obesity. Our purposive sample was developed with participation from the American Heart Association (AHA) and the Robert Wood Johnson Foundation (RWJF).

We initially contacted potential interviewees *via* email and provided project information and eligibility criteria to participate in an interview. We conducted semi-structured interviews with those who accepted our invitation from September 2014 to April 2015. We used an interview guide for all interviews, which contained domains concerning factors that lead organizations to focus on issues related to health equity within their childhood obesity policy work. Each interviewee was asked the following questions: 1) To what extent does your childhood obesity policy work specifically focus on issues related to health equity? "Health equity" generally refers to all people having the opportunity to attain their full health potential. In this initiative, we are focusing primarily on racially, ethnically, and socio-economically

disadvantaged individuals and communities; and 2) To what extent and how do you consult with or partner with communities of color and low-income communities in your work to reduce childhood obesity? Interviews lasted from 20 to 45 minutes, and were recorded and transcribed. Participants received a \$50 Target gift card.

Members of the study team read all transcripts in their entirety. To organize the data, summary matrices with representative quotations were created in Microsoft Excel. These matrices allowed for the initial identification of themes and patterns within the interviews. Open coding was used to develop analytic memos, which identified themes across the three groups and within each group. Members of the study team reviewed the matrices and analytic memos, allowing for iterative data interpretation.

This research was reviewed and approved by a Johns Hopkins Bloomberg School of Public Health Institutional Review Board, MD, USA.

RESULTS

We contacted 55 individuals, and 12 declined to participate or did not respond (78% participation rate). Our final sample consisted of 43 individuals from 19 states and Washington, DC, USA. Within this group, there were 12 policy-makers, 24 NGO representatives, and 7 academics.

Interviewees from all three groups identified their organization's focus area or mission as involving health equity (Table 1). As a result, their work approached childhood obesity policies through this lens. As one NGO representative stated, "*All of our work addresses health equity*". Similarly, one academic noted, "*I don't think we do anything that isn't proportionately focused on low-income people*".

Academics and NGO representatives explained that their funding encourages or requires them to prioritize health equity in their childhood obesity policy work. According to one NGO representative, "*We're funded entirely by grants and contracts within that world, we certainly spend a lot of time thinking and talking about this issue of health equity*".

Policy-makers noted that direct engagement with the communities in which they are situated has led to an increased focus on health equity in their childhood obesity policy work. As one policy-maker stated, "*It's working in that neighborhood and with that community that's really got the health problems and trying to build them up and help them help themselves to work on their health issues*". Finally, several NGO representatives stated that concerns about health equity inherently arise in any efforts related to childhood obesity policies.

Policy-makers and academics found that they could not pursue these interests without relevant data that allowed them to focus on health equity within their broader work on childhood

Group	Influential Factors	Representative Quotation
Academics	Funding	"That's what our funding is for....And so by definition, we are focused on African Americans. We also look at some income-related issues within that, but that's what we do, basically."
	Organizational Focus	"Everything we're doing has its social equity basis to it....I don't think we do anything that isn't proportionately focused on low-income people."
	Availability of Data	"We were able to get data from the state on school level demographics so we could look at race, ethnicity for a student....So we have been able to do data work with that."
NGOs	Organizational focus	"From the very core of the work that we're doing...comes from the lens of health equity."
	Nature of childhood obesity work	"I think unlike some other childhood obesity initiatives, this one is really squarely focused on underserved communities. And so, it's very central to the policy itself."
	Funding	"Part of our work in securing this funding would be to have language and a budget provision that kind of sets up an expectation that health equity is a factor."
Policy-makers	Engagement with the community	"It's not just us trying to determine what health inequities exist. It's the residents themselves that are saying, did you consider or what-about questions."
	Organizational focus	"It's kind of embedded in our mission to provide services to disadvantaged populations."
	Availability of Data	"We also do a lot of surveillance not just based on changes in health in general but also changes in disparity. So we're constantly looking at differences between rich and poor, between people of color, etc."

Table 1: Factors that influence the extent to which childhood obesity policy work focuses on health equity.

obesity policies. For example, a policy-maker explained, "*The big challenge of ours is getting data at the neighborhood levels that is critical for developing strategies and initiatives and then evaluating outcomes as well, what our impact is*".

DISCUSSION

NGO representatives and academics noted that certain funding streams encourage or require a health equity focus within their childhood obesity policy work. Because some organizations may overlook or not prioritize health equity research, public and private funders should consider whether they want to require a health equity focus when developing calls for proposals.

Policy-makers and academics discussed how availability of data influences whether their childhood obesity policy work accounts for health equity. This suggests that, even if an interest in health equity exists, it may not be pursued if data are lacking or difficult to access. Governmental and other groups that manage large data sets should identify opportunities to engage with researchers (e.g., conferences, webinars) to share information about opportunities to incorporate health equity data into analysis relevant to childhood obesity policy.

Our study's strengths include the geographic and professional diversity of our interviewees, but several limitations should be noted. The generalizability of our findings may be limited to individuals who fit into one of the groups on which we focused: academics, NGO's, and policy-makers. Also, the individuals in our purposive sample had a demonstrated interest in childhood obesity. They may have been more likely to find the subject matter, and thus participation in the interview, more appealing than individuals without similar experience.

CONCLUSION

Well-documented disparities among socio-economic, racial, and ethnic groups underscore the importance of incorporating

health equity considerations into childhood obesity policies. Yet, to date the factors that motivate organizations to focus on health equity within the broader context of childhood obesity policy have remained unclear. Our interviews identified several factors-including organizational mission, funding requirements, and data availability as influencing this decision.

These findings can influence current activities and policy debates in several ways. First, funders may sway academics and NGO's by explicitly requiring a focus on health equity when they issue a call for proposals related to childhood obesity policy. Second, processes for easily sharing large data sets that incorporate health equity data-such as those maintained by the federal government-with academics should be developed and promoted. Finally, community-based NGO's should actively engage with their local and state representatives, as these officials have noted the importance of such interactions in shaping their focus on health equity within childhood obesity policy.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to disclose.

REFERENCES

1. Skinner AC, Mayer ML, Flower K, Weinberger M. Health status and health care expenditures in a nationally representative sample: How do overweight and healthy-weight children compare? *Pediatrics*. 2008; 121(2): e269-e277. doi: [10.1542/peds.2007-0874](https://doi.org/10.1542/peds.2007-0874)

2. Juonala M, Magnussen CG, Berenson GS, et al. Childhood adiposity, adult adiposity, and cardiovascular risk factors. *New Engl J Med*. 2011; 365(20): 1876-1885. doi: [10.1056/NEJMoa1010112](https://doi.org/10.1056/NEJMoa1010112)
3. Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of obesity and trends in body mass index among US children and adolescents, 1999-2010. *JAMA*. 2012; 307(5): 483-490. doi: [10.1001/jama.2012.40](https://doi.org/10.1001/jama.2012.40)
4. McCrindle BW. Cardiovascular consequences of childhood obesity. *Can J Cardiol*. 2015; 31(2): 124-130. doi: [10.1016/j.cjca.2014.08.017](https://doi.org/10.1016/j.cjca.2014.08.017)
5. Berentzen NE, van Rossem L, Gehring U, et al. Overweight patterns throughout childhood and cardiometabolic markers in early adolescence. *Int J Obes*. 2016; 40(1): 58-64. doi: [10.1038/ijo.2015.196](https://doi.org/10.1038/ijo.2015.196)
6. Blanck HM, Kim SA. Creating supportive nutrition environments for population health impact and health equity: An overview of the nutrition and obesity policy research and evaluation network's efforts. *Am J Prev Med*. 2012; 43(3 Suppl 2): S85-S90. doi: [10.1016/j.amepre.2012.06.005](https://doi.org/10.1016/j.amepre.2012.06.005)
7. IOM, Institute of Medicine, Committee on Childhood Obesity Prevention. Creating equal opportunities for a healthy weight: Workshop summary. Washington, DC, USA: National Academies Press; 2013.
8. Dodd AH, Briefel R, Cabili C, Wilson A, Crepinsek MK. Disparities in consumption of sugar-sweetened and other beverages by race/ethnicity and obesity status among United States school children. *J Nutr Educ Behav*. 2013; 45(3): 240-249. doi: [10.1016/j.jneb.2012.11.005](https://doi.org/10.1016/j.jneb.2012.11.005)
9. Kimbro RT, Denney JT. Neighborhood context and racial/ethnic differences in young children's obesity: Structural barriers to interventions. *Soc Sci Med*. 2013; 95: 97-105. doi: [10.1016/j.socscimed.2012.09.032](https://doi.org/10.1016/j.socscimed.2012.09.032)
10. Shih M, Dumke KA, Goran MI, Simin PA. The association between community-level economic hardship and childhood obesity prevalence in Los Angeles. *Pediatr Obes*. 2013; 8(6): 411-417. doi: [10.1111/j.2047-6310.2012.00123.x](https://doi.org/10.1111/j.2047-6310.2012.00123.x)
11. Payne GH, James SD Jr, Hawley L, et al. CDC's Health Equity Resource Toolkit: disseminating guidance for state practitioners to address obesity disparities. *Health Promot Pract*. 2015; 16(1): 84-90. doi: [10.1177/1524839914538967](https://doi.org/10.1177/1524839914538967)
12. World Health Organization. Health systems: Equity. 2006. Web site. <http://www.who.int/healthsystems/topics/equity/en/>. Accessed August 3, 2016
13. Braveman P, Gruskin S. Defining equity in health. *J Epidemiol Community Health*. 2003; 57: 254-258. doi: [10.1136](https://doi.org/10.1136)
14. Bleich SN, Jones-Smith J, Jones H, O'Hara M, Rutkow L. The voices for healthy kids campaign and U.S. state legislation to prevent childhood obesity. *Am J Public Health*. 2016; 106(3): 436-439. doi: [10.2105/AJPH.2015.303002](https://doi.org/10.2105/AJPH.2015.303002)

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Compliance and Microbial Findings Among Intensive Care Unit (ICU) Health Care Workers in a Tertiary Hospital in Sudan: Pre- and Post-Intervention Study

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ABSTRACT

Background: Health care associated infections are the major cause of morbidity, mortality and increased economic burden throughout the world. This study assessed the impact of hand hygiene training program on microbiological finding and compliance of the health care workers in the adult intensive care unit (ICU) in a tertiary hospital in Khartoum, Sudan.

Methods: A pre- and post-intervention study design in which a multi-modal strategy for hand hygiene was implemented.

Results: There was highly significant compliance towards hand hygiene among the health care workers in adult ICU with overall difference in compliance of 47.2%. As well the positive growth of the samples taken from fingertips was reduced from 88.2% to 32.4% post-intervention.

Conclusion: The study concluded that multi-modal interventions strategies had a good impact in improving compliance and reduction of fingertips microbiological growth among the health care workers in adult ICU.

KEYWORDS: Compliance; Microbial findings; ICU health care workers; Tertiary hospital pre- and post-intervention study.

ABBREVIATIONS: ICU: Intensive Care Unit; HCAs: Hospital acquired infections; HCWs: Health Care Workers; WHO: World Health Organization; SMSB: Sudan Medical Specialization Board.

INTRODUCTION

Hospital acquired infections (HCAs) are any infections occurring in a hospital or any health care facility within first 48 hours of admission other than initial presenting illness, or within 30 days after patient has been discharge home.¹ HCAs can be occurred locally or systematically as a result of invasion of infectious organism or due to its toxin which are not present at the time of admission.² The infectious organisms may originate from patient own flora (endogenous) or infection through contaminated hands of staff (cross-infection) or infection through contaminated instruments and environment (exogenous). The major cause of transmission of infectious organisms is because of lack of personal hygiene among the health care workers, especially improper hand washing, disposal of sharp instruments and use of personal protective devices, such as gloves, facemasks and goggles.³⁻⁴ The most important sites for HCAs infections are: urinary tract, lower respiratory tract, surgical site, blood stream and other sites like skin and soft tissues.⁵ Age of patient, severity of underlying disease, immune status, duration of hospitalization, virulence of the organism, resistant to antimicrobial agents, invasive interventions and devices, lack of adherence to infection control standard precautions among health care workers and improper ventilation and cleaning in health care facilities are the major risk factors.⁶ HCAs cause significant concern regarding the safety and health care quality worldwide.⁷

HCAIs have been identified as a fundamental priority and were selected as the topic of the first global patient safety challenge. Hand hygiene is one of the 5 key initiatives set out by the World Alliance for Patient Safety's. Hand hygiene relates to the removal of visible soil and removal or killing of transient microorganisms from the hands while maintaining the good skin integrity resulting from a hand care program. Hand hygiene includes surgical hand antisepsis, hand washing, antiseptic hand wash and alcohol-based hand rub.⁷ This study aimed to assess the impact of hand hygiene training program on hand hygiene compliance and microbiological findings among health care workers in an adult ICU in a tertiary hospital.

METHODOLOGY

Study Design

A pre- and post-intervention study design in which a multi-modal strategy for hand hygiene was implemented during 2012-2013.

Study Setting

The study was conducted in a tertiary hospital in Khartoum, Sudan. It is a central hospital, which was established to provide tertiary care. The ICU unit consists of three rooms with 10 ICU beds, and 34 health care workers. The unit is so busy throughout the year.

Study Population and Sample Size

All health care workers (HCWs) at adult ICU unit in the hospital were included in the study. They are 34 HCWs: 3 consultants, 14 general practitioners, 10 sisters, 4 medical assistants and 3 cleaners.

Intervention

The study was conducted into 3 phases: Pre-intervention, intervention and post-intervention.

Pre-Intervention Survey

All health care personnel who came in contact with patients in the study area were observed for their hand hygiene compliance unobtrusively by the observer during the day-time shift, which was the busiest shift. The observer was the infection control coordinator in the hospital, who had been trained for one week before the observation phase. The observation checklist was adopted from the World Health Organization (WHO) standard observation checklist "My five moments for hand hygiene". The observation continued for 4 weeks. The target patient who was selected randomly was observed continuously for the entire 15 minutes period. The category of the health care personnel and the compliance for each hand hygiene opportunity that presented were noted by the observer during the observations. Compliance was measured by dividing the number of positive actions (the numerator) by the number of indications (the denominator).

According to WHO the positive actions are hand washing and alcohol hand rub in the observation checklist while gloves and no action are considered as negative actions. So Compliance (%) = $\frac{\text{Performed positive actions}}{\text{Opportunity}} \times 100$.

Assessment of microbiological finding: The culture medium was prepared, sterilized, labelled, and kept properly for each phase pre- post-intervention, the HCWs were asked to press their fingertips gently for 5 seconds into the blood agar plates after performing hand hygiene according to their usual way. The inoculated media were incubated at the optimum temperature (35-37 °C) for 24 hours, then reading of the culture medium for the presence of growth, the number of colonies in the culture media, gram staining was done to identify the growth.

Intervention: It was a multi-modal intervention including training which was conducted in the hospital, using portable multimedia covering the following: lecture covering: definition of HCAIs, worldwide burden of HCAIs, impact of HCAIs, most frequent site and risk factors, general risk factors, aetiology and route of transmission, diagnosis and treatment, prevention and control of HCAIs. Lecture on hand hygiene covering: introduction and importance of hand hygiene, definitions, hand transmission, indication of hand hygiene according to my five moment, hand hygiene technique, steps of hand washing and hand rubbing, missed area during hand rubbing and hand washing, steps of surgical hand hygiene, gloving, efficacy of hand hygiene preparations in killing bacteria, self-reported factors for poor adherence with hand hygiene and figures on organisms present on patient skin or the immediate environment, organism transfer from patient to HCWs' hands, organism survival on HCWs' hands, incorrect hand cleaning and failure to cleanse hands results in between-patient cross-transmission. Hand hygiene video show covering the following: overview of HCAIs, indication of hand hygiene, hand hygiene technique, equipment, appropriate use of gloves, policies on jewellery, finger nail hygiene, selected complication and religious issues.⁸

The visual reminders: posters on indication of hand hygiene, steps of hand washing and steps of alcohol hand rub. Verbal reminder was conducted by infection control sister in her regular visits to the study area also were conducted by infection control coordinator.

Post-intervention: Same as in the phase I except that the health care workers were asked to press their fingertips after performing hand hygiene according to training recommendations.

DATA COLLECTION AND ANALYSIS

The data was collected and analysed using SPSS version 20. The 2 main outcomes are: compliance with hand hygiene standards and microbial growth.

ETHICAL CLEARANCE

The ethical approval was obtained from Sudan Medical Special-

ization Board (SMSB). Permission from the hospital director and from the head of ICU department through official letter from the head of the quality general directorate was obtained. Verbal consent was taken from HCWs and patients after through explanation of the aim and the methodology of the study.

RESULTS

In the study the majority of the population were female (58.82%) and of them 70.59% within the age groups 30-39 years. Most of them were medical doctors (Table 1). Compliance towards hand hygiene was significantly increased post-intervention (Table 2) as well microbiological growth was significantly reduced (Table 3). Before the intervention, the growth scale was mainly maximum and moderate growth. This was shifted after intervention to no growth or little growth (Table 4).

DISCUSSION

In this study, a multi-modal interventional strategy was used, with intensive educational sessions based on “my five moments

of hand hygiene” as well as displaying posters, providing verbal reminders, video show, training role model and ensuring easy and ample supply of hand hygiene products in the ICU unit, with these strategies there was significant improvement in the compliance and significant reduction in finger tip bacterial growth after intervention. A review of literature suggests that single intervention programs produce less success in leaving a lasting impact on hand hygiene compliance.^{9,10}

Multimodal interventional strategies, which include audits, performance feedbacks, education, memos, posters and films, ensuring easy availability and supply of alcohol-based hand rubs and strategies aiming to improve accessibility to hand hygiene agents, have been more successful.¹¹⁻¹⁵

In a study by Lam et al,¹³ the hand hygiene compliance before and after the implementation of a multimodal implementation program in a neonatal ICU concluded that an effective education program could improve hand hygiene compliance and reduce the rate of health care associated infections. In another study conducted in five adult ICUs, an intervention strategy

Socio-demographic characteristic	Frequency (n)	%
Age (years)		
20-30	5	14.71%
30-39	24	70.59%
40-49	4	11.76%
50>	1	2.94%
Gender		
Male	14	41.18%
Female	20	58.82%
Occupation		
Doctors	17	50.00%
Sisters	10	29.41%
Medical assistants	4	11.76%
Cleaners	3	8.83%

Table 1: Socio-demographic characteristics of the respondents (n=34).

Category	Before intervention	After intervention	Difference	p-value
Doctors (n=17)	3 (17.6%)	13 (76.4%)	58.8	<0.001
Sisters (n=10)	3 (30.0%)	7 (70.0%)	40.0%	0.178
Medical assistants (n=4)	1 (25.0%)	3 (75.0%)	25.0%	0.485
Cleaners(n=3)	1 (33.3%)	1 (33.3%)	0.00%	0.999
Overall compliance (n=34)	9 (26.4%)	25 (73.5%)	47.1%	<0.001

Table 2: HCWs compliance pre-and post- intervention (n=34).

Category	Freq. (%) of positive growth pre-intervention	Freq. (%) of positive growth post-intervention	Difference	p-value
Doctors (n=17)	15 (88.2%)	6 (35.3%)	52.9%	0.002
Sisters (n=10)	9 (90.0%)	3 (30.0%)	60.0%	0.19
Medical assistants (4)	3 (75.0%)	2 (50.0%)	25.0%	0.999
Cleaners (3)	3 (100.0%)	0 (0%)	100.0%	1.000
Total	30 (88.2%)	11 (32.4%)	55.8%	<0.001

Table 3: Microbiological finding pre-and post- intervention (n=34).

Category	Scaling of growth	Pre-intervention	Post-intervention
Doctors	No growth	11.1%	66.6%
	Little growth	5.6%	22.2%
	Some growth	11.1%	5.6%
	Moderate growth	27.8%	5.6%
	Maximum growth	44.4%	0.0%
Sisters	No growth	10%	60%
	Little growth	30%	40%
	Some growth	40%	0%
	Moderate growth	20%	0%
	Maximum growth	0%	0%
Medical assistants	No growth	25.0%	50%
	Little growth	0%	50%
	Some growth	25.0%	0%
	Moderate growth	25.0%	0%
	Maximum growth	25.0%	0%
Cleaners	No growth	0%	100%
	Little growth	0%	0%
	Some growth	0%	0%
	Moderate growth	50%	0%
	Maximum growth	50%	0%

Table 4: Microbiological growth scaling pre- and post- intervention.

consisting of educational program and improving standards of catheter care resulted in a significant decrease in catheter-related blood stream infection rates, with significant increase in hand hygiene compliance.¹⁶

In conclusion a multi-modal interventions strategy such as the one that has been conducted revealed a good impact in improving compliance of health care workers and reduction of fingertips microbiological growth among the study groups.

The study recommends to hospital authority to continue the intervention at regular intervals. Avenues of future research would include conducting further studies on hand hygiene to demonstrate reduction in HCAs, as well as reduced morbidity and mortality in our study setting. Training and feedback sessions on hand hygiene especially for new staff and reminders sessions for the old staff should be maintained.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

REFERENCES

1. Nguyen QV. Hospital-Acquired Infections. 2009. Web site. <http://emedicine.medscape.com/article/967022-overview>. Accessed August 22, 2016
2. Abdel-Fattah MM. Surveillance of nosocomial infections at a Saudi Arabian military hospital for a one-year period. *Ger Med Sci*. 2005; 3: Doc06.
3. WHO/CDS/CSR/EPH/2002.12. Prevention of hospital-acquired infections. 2nd ed. 2002. Web site. <http://apps.who.int/medicinedocs/documents/s16355e/s16355e.pdf>. Accessed August 22, 2016
4. EMHJ. Thousands of health workers supporting pilgrims as they move to Arafat Mountain. 2016. Web site. <http://www.emro.who.int/index.html>. Accessed August 22, 2016
5. Klevens RM, Edwards JR, Richards CL Jr, et al. Estimating health care-associated infections and deaths in U.S. hospitals, 2002. *Public Health Rep*. 2007; 122(2): 160-166. Web site. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1820440/>. Accessed August 22, 2016
6. Groeneveld AB. Risk factors for increased mortality from hospital-acquired versus community-acquired infections in febrile medical patients. *Am J Infect Control*. 2009; 37(1): 35-42. doi: 10.1016/j.ajic.2007.11.011
7. WHO. WHO guide lines on hand hygiene in health care. 2009. Web site. <http://www.who.int/gpsc/5may/tools/9789241597906/en/>. Accessed August 22, 2016
8. Hand Hygiene. New England Journal medicine-video show. Web site. <https://www.youtube.com/watch?v=uGmMDC-4IMY>. Accessed August 22, 2016
9. Tibballs J. Teaching hospital medical staff to handwash. *Med J Aust*. 1996; 164(7): 395-398. Web site. <https://www.mja.com.au/journal/1996/164/7/teaching-hospital-medical-staff-handwash>. Accessed August 22, 2016
10. Larson E, McGeer A, Quraishi ZA, et al. Effects of an au-

tomated sink on handwashing practices and attitudes in high-risk units. *Infect Control Hosp Epidemiol.* 1991; 12(7): 422-428. Web site. https://www.jstor.org/stable/30148304?seq=1#page_scan_tab_contents. Accessed August 22, 2016

11. Hugonnet S, Perneger TV, Pittet D. Alcohol-based handrub improves compliance with hand hygiene in intensive care units. *Arch Intern Med.* 2002; 162(9): 1037-1043. doi: [10.1001/archinte.162.9.1037](https://doi.org/10.1001/archinte.162.9.1037)

12. Pittet D, Hugonnet S, Harbarth S, et al. Effectiveness of a hospital-wide programme to improve compliance with hand hygiene. *Lancet.* 2000; 356(9238): 1307-1312. doi: [10.1016/S0140-6736\(00\)02814-2](https://doi.org/10.1016/S0140-6736(00)02814-2)

13. Lam BC, Lee J, Lau YL. Hand hygiene practices in a neonatal intensive care unit: A multimodal intervention and impact on nosocomial infection. *Pediatrics.* 2004; 114(5): e565-571. Web site. <http://pediatrics.aappublications.org/content/114/5/e565.long>. Accessed August 22, 2016

14. Bischoff WE, Reynolds TM, Sessler CN, Edmond MB, Wenzel RP. Handwashing compliance by health care workers: The impact of introducing an accessible, alcohol-based hand antiseptic. *Arch Intern Med.* 2000; 160(7): 1017-1021. doi: [10.1001/archinte.160.7.1017](https://doi.org/10.1001/archinte.160.7.1017)

15. Dubbert PM, Dolce J, Richter W, Miller M, Chapman SW. Increasing ICU staff handwashing: Effects of education and group feedback. *Infect Control Hosp Epidemiol.* 1990; 11(4): 191-193. Web site. https://www.jstor.org/stable/30147022?seq=1#page_scan_tab_contents. Accessed August 22, 2016

16. Zingg W, Imhof A, Maggiorini M, Stocker R, Keller E, Ruef C. Impact of a prevention strategy targeting hand hygiene and catheter care on the incidence of catheter-related bloodstream infections. *Crit Care Med.* 2009; 37(7): 2167-2173. doi: [10:1097/CCM0b013e3181a02d8f](https://doi.org/10.1097/CCM0b013e3181a02d8f)

Research

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Management of Hypertension by Primary Health Care Providers in Khartoum, Sudan

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ABSTRACT

Background: Primary health care is the level where promotive, preventive, curative services are provided at the same place. It is thus the level in which modifiable risk factors for hypertension can be addressed together with treatment of known hypertensive patients.

Objectives: This study addressed the quality of management of hypertension in Public Primary Health Care Facilities in East-Nile locality, Khartoum State, Sudan.

Methodology: A Facility-based cross-sectional study was conducted, in which 26 primary public health centers and 3 rural hospitals were included. All the health care providers—119—in the public health facilities available during the data collection period, using 2 well-structured questionnaires were used. An ethical approval was obtained from the Sudan Medical Specialization Board (SMSB), and verbal consent was obtained from each health care provider prior to the interview. The collected data were analyzed using the Statistical Package for Social Science (SPSS) version 15.

Results: The majority of care providers, (71.4% of the physicians, and 93.5% of other care providers) were not trained on hypertension management. The study revealed marked gaps in the knowledge domain of the other health care providers, such as the standard management of hypertension, the proper measurement of blood pressure; lifestyle modification and serious complications of hypertension.

Conclusions: There is a need for strengthening the management of hypertension at primary care level through training and regular supervision.

KEYWORDS: Hypertension; Primary health care; Primary health care providers; Non-communicable diseases (NCDs).

ABBREVIATIONS: NCDs: Non-communicable diseases; QA: Quality Assurance; PHC: Primary Health Care; DASH: Dietary Approach to Stop Hypertension.

INTRODUCTION

Globally there are one billion hypertensive patients due to prevalence of contributing modifiable risk factors such as unhealthy diet, physical inactivity, tobacco and alcohol use, and hyperlipidemia—which are not addressed well yet, and the number of patients is expected to rise. In the Eastern Mediterranean Region, the prevalence of hypertension averages 26% and it affects approximately 125 million individuals.¹

Hypertension has the highest prevalence among the major non-communicable diseases (NCDs) in Sudan represented a quarter of NCDs.² Hypertension in Sudan is one of the 10 leading diseases treated in outpatients of health facilities and also is one of the 10 leading causes of deaths in Sudan.³

Proper management of hypertension has been associated with about a 40% reduction in the risk of stroke and about a 15% reduction in the risk of myocardial infarction. Thus, with applying standard management of hypertension, we can reduce the major complications that

lead to morbidity, disability and mortality.⁴ The package of services include training of care providers combined with provision of preventive and curative services as well as an education of patients and their relatives.

Despite the importance of quality, to date there have been few sustained quality assurance (QA) efforts in developing countries.⁵ Many evaluations have focused on measuring changes in mortality and morbidity, or on measuring coverage rates. Few have emphasized the quality of services or the process of service delivery. Primary health care (PHC) level is the first contact of the community with the health system, and high percentage of population use PHC, as it is more accessible and affordable and hence it has a drive to reach vulnerable populations.

In Sudan delivery of care has been based on the PHC approach, with over 2078 PHC centers and 380 rural hospitals, according to Federal Ministry of Health, health map, in October 2012, distributed all over Sudan, supposed to deliver; promotive, protective, curative, and rehabilitative services, but have never functioned as such as mentioned in non-communicable diseases strategy 2010.

The main purpose of this study is to assess the providers competencies and to explore the quality of hypertension management at primary health care facilities in Khartoum, Sudan. Such assessment is highly needed to identify points of weakness within programs that call for strengthening.⁶

METHODOLOGY

A facility-based cross-sectional descriptive study was conducted at 26 public health centers and 3 rural hospitals in East Nile locality, Khartoum State, Sudan.

The study population composed of all the health care providers in the public health facilities available during the study period after their consent had been obtained. They were 119 care providers of various categories: 42 physicians (10 consultants and 32 general practitioners) and 77 non-physicians (12 medical assistants, 51 nurses, 4 midwives and 10 health visitors).

Two well-structured questionnaires were used:

A self-administered questionnaire was used to collect data from physicians, and another questionnaire was used to interview non-physicians providers.

The collected data were analyzed using the Statistical Package for Social Science (SPSS) version 15.

RESULTS

Almost 2/3rd of physicians (61.9%) did not know that hypertension is one of the serious risks for cardiovascular diseases. On the other hand, the majority of them has fair knowledge on sus-

picion of secondary hypertension and has fair knowledge on the classification of hypertension. Nearly all of them identified the serious complications of hypertension.

Almost all (97.6%) physicians agreed on the lifestyle modification as important measure for preventing or delaying the onset of hypertension and its complications. They identified all the risk factors (obesity/overweight, physical inactivity, unhealthy diet, tobacco use, dyslipidaemia and alcohol use), and knew the risky groups for developing hypertension. The majority (90%) of physicians have good skills on standard management of hypertension (non-drug treatment or life style modification, and drug treatment), and the same result was found for the investigations needed for hypertension. All of the physicians agreed on referral of the patients to high facility levels and on importance of regular follow-up for hypertensive patients (Table 1).

In Table 2, the majority of non-physicians did not know that hypertension is one of the serious risks for cardiovascular diseases and 96.8% of them did not know the standard cuff size of the devices. Almost all of them did not know the recommended instructions before checking the blood pressure. On the other hand, 78.1% and 93.2% of them identified hypertensive cardiac damage and brain damage as complication respectively, but only 12.3% and 34.2% of them knew hypertensive vascular damage and hypertensive renal damage respectively. However, their knowledge of risk factors varies. Regarding the referral practice, 87.5% of non-physicians agreed on referral of the patients to high facility levels, and 87.5% of them were willing to arrange means of transportation for that. Most of non-physicians agreed with regular follow-up of the patients.

DISCUSSION

The quality of technical care consists in the application of medical science and technology in a way that maximizes its benefits to health without correspondingly increasing its risks. The degree of quality is, therefore, the extent to which the care provided expected to achieve the most favorable balance of risks and benefits.⁷

Proper performance (according to standards) of interventions that are known to be safe, that are affordable to the society in question, and that have the ability to produce an impact on mortality, morbidity, disability, and malnutrition.⁶

Moreover, the aspects for assessment of the quality of the services include suitability for providing the programmed services in reliable manner. Therefore, quality can be measured by the components and dimensions of the health care system.

The activities should be delivered in a manner that integrates attention to the essential health care needs, combining preventive and curative aspects, as well as an educational component.⁸

Training (baseline and in-service), is one of the qual-

Item	Definition of item	Agree	Disagree
Definition of hypertension	<ul style="list-style-type: none"> ▪ Arterial blood pressure with doubling of cardiovascular risk ▪ Systolic blood pressure >140 mmHg or diastolic blood pressure >90 mmHg 	<ul style="list-style-type: none"> ▪ 16 (38%) ▪ 40 (95%) 	<ul style="list-style-type: none"> ▪ 26 (62%) ▪ 2 (5%)
Suspicion of secondary hypertension	<ul style="list-style-type: none"> ▪ Cushing syndrome ▪ Aortic Coarctation ▪ Polycystic kidney ▪ Aortic disease ▪ Renovascular hypertension 	<ul style="list-style-type: none"> ▪ 35 (83%) ▪ 30 (71%) ▪ 35 (83%) ▪ 29 (69%) ▪ 30 (71%) 	<ul style="list-style-type: none"> ▪ 7 (17%) ▪ 12 (29%) ▪ 7 (17%) ▪ 13 (31%) ▪ 12 (29%)
Classification of hypertension	<ul style="list-style-type: none"> ▪ Normal : S<130 D<85 ▪ High-normal S 130-139 D 85-89 ▪ Grade 1: S 140-159 D 90-99 ▪ Grade 2: S 160-179 D 100-109 ▪ Grade 3: S>180 D>110 ▪ Isolated Systolic Hypertension S>140 D<90 	<ul style="list-style-type: none"> ▪ 37 (88%) ▪ 32 (76%) ▪ 40 (95%) ▪ 40 (95%) ▪ 39 (93%) ▪ 24 (57%) 	<ul style="list-style-type: none"> ▪ 5 (12%) ▪ 10 (24%) ▪ 2 (5%) ▪ 2 (5%) ▪ 3 (7%) ▪ 18 (43%)
Risky group for developing hypertension	<ul style="list-style-type: none"> ▪ Pre-hypertensive ▪ Family history of hypertension ▪ Diabetic patients ▪ Hypertension with pregnancy ▪ Individual with risk factors ▪ Age above 40 years 	<ul style="list-style-type: none"> ▪ 27 (64%) ▪ 41 (98%) ▪ 38 (90.5%) ▪ 40 (95%) ▪ 41 (98%) ▪ 33 (79%) 	<ul style="list-style-type: none"> ▪ 15 (36%) ▪ 1 (2%) ▪ 4 (9.5%) ▪ 2 (5%) ▪ 1 (2%) ▪ 9 (21%)
Serious complication of hypertension	<ul style="list-style-type: none"> ▪ Cardiac damage ▪ Vascular damage ▪ Renal damage ▪ Brain damage 	<ul style="list-style-type: none"> ▪ 41 (98%) ▪ 41 (98%) ▪ 41 (98%) ▪ 38 (90.5%) 	<ul style="list-style-type: none"> ▪ 1 (2%) ▪ 1 (2%) ▪ 1 (2%) ▪ 4 (9.5%)
Modifiable risk factors of hypertension	<ul style="list-style-type: none"> ▪ Tobacco use ▪ Unhealthy diet ▪ Alcohol use ▪ Sedentary life ▪ Obesity/overweight ▪ Dyslipidaemia 	<ul style="list-style-type: none"> ▪ 36 (86%) ▪ 40 (95%) ▪ 39 (93%) ▪ 36 (86%) ▪ 42 (100%) ▪ 31 (74%) 	<ul style="list-style-type: none"> ▪ 6 (14%) ▪ 2 (5%) ▪ 3 (7%) ▪ 6 (14%) ▪ 0 ▪ 11 (26%)
Treatment of hypertension	<ul style="list-style-type: none"> ▪ Non-drug treatment ▪ Drug treatment 	<ul style="list-style-type: none"> ▪ 38 (90.5%) ▪ 40 (95%) 	<ul style="list-style-type: none"> ▪ 4 (9.5%) ▪ 2 (5%)
Investigations needed for hypertensive patient	<ul style="list-style-type: none"> ▪ Urine for albumin ▪ Renal function test ▪ Lipid profile ▪ X-ray chest ▪ ECG 	<ul style="list-style-type: none"> ▪ 42 (100%) ▪ 42 (100%) ▪ 41 (98%) ▪ 38 (90.5%) ▪ 42 (100%) 	<ul style="list-style-type: none"> ▪ 0 ▪ 0 ▪ 1 (2%) ▪ 4 (9.5%) ▪ 0
Messages to delay/prevent hypertension	<ul style="list-style-type: none"> ▪ Eat healthy diet ▪ Decrease body weight ▪ Regular physical exercise ▪ Stop tobacco use 	<ul style="list-style-type: none"> ▪ 41 (100%) ▪ 41 (100%) ▪ 41 (100%) ▪ 39 (95%) 	<ul style="list-style-type: none"> ▪ 0 ▪ 0 ▪ 0 ▪ 2 (5%)
Methods to prevent hypertension's complications	<ul style="list-style-type: none"> ▪ Lifestyle modification ▪ Continuous medication ▪ Regular follow-up 	<ul style="list-style-type: none"> ▪ 41 (98%) ▪ 42 (100%) ▪ 42 (100%) 	<ul style="list-style-type: none"> ▪ 1 (2%) ▪ 0 ▪ 0
Referral of hypertensive patients to high facility levels	<ul style="list-style-type: none"> ▪ Acceptant for referral ▪ Can arrange transportation if no ambulance 	<ul style="list-style-type: none"> ▪ 42 (100%) ▪ 32 (76%) 	<ul style="list-style-type: none"> ▪ 0 ▪ 10 (24%)
Importance of regular follow-up for hypertensive patients	<ul style="list-style-type: none"> ▪ Ask the patient for regular follow-up ▪ Need health education in every follow-up visits ▪ Need to change the treatment plan in follow-up visits 	<ul style="list-style-type: none"> ▪ 41 (98%) ▪ 36 (86%) ▪ 24 (57%) 	<ul style="list-style-type: none"> ▪ 1 (2%) ▪ 6 (14%) ▪ 18 (43%)

Table 1: Knowledge and practice of physicians at primary health care towards standard management of hypertension.

ity's indicators, in this study the majority of care providers were not trained. This means that the in-service training on hypertension management is limited, and this can affect the competency of the health care providers, and consequently the quality of services provided to hypertensive patients.

For the knowledge of care providers; Most of the physicians, did not know that hypertension is one of the serious risk for cardiovascular diseases. This finding can be counted as negative indicator for the health care providers, and the main reason, most probably, is due to the fact that the study care providers were not subjected to quality comprehensive in-service training on hypertension management.

In addition, most of the physicians have fair knowledge on suspicion of secondary hypertension and the classification of hypertension, serious complications of hypertension, so this can help much in early detection and proper diagnosis and management of hypertension and its complications.

Moreover, the possibility to delay the onset of hypertension and its complications, nearly all physicians, mentioned that, continuous drugs used with regular follow-up could prevent hypertensive's complications.

Lifestyle modification could reduce systolic blood pressure: by 5-20 mmHg/10 kg with weight reduction; 8-14 mmHg by adoption of dietary approach to stop hypertension (DASH);

Item	Definition of item	Agree	Disagree
Definition of hypertension	<ul style="list-style-type: none"> ▪ Arterial blood pressure with doubling of cardiovascular risk ▪ Systolic blood pressure >140 mmHg or diastolic blood pressure >90 mmHg 	<ul style="list-style-type: none"> ▪ 6 (8%) ▪ 68 (88%) 	<ul style="list-style-type: none"> ▪ 71 (92%) ▪ 9 (12%)
Risky group for developing hypertension	<ul style="list-style-type: none"> ▪ Pre-hypertensive ▪ Family history of hypertension ▪ Diabetic patients ▪ Hypertension with pregnancy ▪ Individual with risk factors ▪ Age above 40 years 	<ul style="list-style-type: none"> ▪ 2 (3%) ▪ 68 (94%) ▪ 20 (28%) ▪ 63 (87.5%) ▪ 47 (65%) ▪ 45 (62.5%) 	<ul style="list-style-type: none"> ▪ 70 (97%) ▪ 4 (6%) ▪ 52 (72%) ▪ 9 (12.5%) ▪ 25 (35%) ▪ 27 (37.5%)
Serious complication of hypertension	<ul style="list-style-type: none"> ▪ Cardiac damage ▪ Vascular damage ▪ Renal damage ▪ Brain damage 	<ul style="list-style-type: none"> ▪ 57 (78%) ▪ 9 (12%) ▪ 25 (34%) ▪ 68 (93%) 	<ul style="list-style-type: none"> ▪ 16 (22%) ▪ 64 (88%) ▪ 48 (66%) ▪ 5 (7%)
Modifiable risk factors of hypertension	<ul style="list-style-type: none"> ▪ Tobacco use ▪ Unhealthy diet ▪ Alcohol use ▪ Sedentary life ▪ Obesity/overweight ▪ Dyslipidaemia 	<ul style="list-style-type: none"> ▪ 60 (92%) ▪ 36 (55%) ▪ 15 (23%) ▪ 12 (18.5%) ▪ 63 (97%) ▪ 18 (28%) 	<ul style="list-style-type: none"> ▪ 5 (8%) ▪ 29 (45%) ▪ 50 (77%) ▪ 53 (81.5%) ▪ 2 (3%) ▪ 47 (72%)
The standard measurement of blood pressure	<ul style="list-style-type: none"> ▪ Factors affecting the blood pressure ▪ Standard cuff size of the devices 	<ul style="list-style-type: none"> ▪ 1 (2%) ▪ 2 (3%) 	<ul style="list-style-type: none"> ▪ 62 (98%) ▪ 61 (97%)
Investigations needed for hypertensive patient	<ul style="list-style-type: none"> ▪ Urine for albumin ▪ Renal function test ▪ Lipid profile ▪ X-ray chest ▪ ECG 	<ul style="list-style-type: none"> ▪ 47 (77%) ▪ 27 (44%) ▪ 37 (61%) ▪ 13 (21%) ▪ 44 (72%) 	<ul style="list-style-type: none"> ▪ 14 (23%) ▪ 34 (56%) ▪ 24 (39%) ▪ 48 (79%) ▪ 17 (28%)
Messages to delay/prevent hypertension	<ul style="list-style-type: none"> ▪ Eat healthy diet ▪ Decrease body weight ▪ Regular physical exercise ▪ Stop tobacco use 	<ul style="list-style-type: none"> ▪ 41 (61%) ▪ 63 (94%) ▪ 35 (52%) ▪ 62 (92.5%) 	<ul style="list-style-type: none"> ▪ 26 (39%) ▪ 4 (6%) ▪ 32 (48%) ▪ 5 (7.5%)
Methods to prevent hypertension's complications	<ul style="list-style-type: none"> ▪ Lifestyle modification ▪ Continuous medication ▪ Regular follow-up 	<ul style="list-style-type: none"> ▪ 29 (38%) ▪ 76 (100%) ▪ 76 (100%) 	<ul style="list-style-type: none"> ▪ 47 (62%) ▪ 0 ▪ 0
Referral of hypertensive patients to high facility levels	<ul style="list-style-type: none"> ▪ Acceptant for referral ▪ Can arrange transportation if no ambulance 	<ul style="list-style-type: none"> ▪ 14 (87.5%) ▪ 14 (87.5%) 	<ul style="list-style-type: none"> ▪ 2 (12.5%) ▪ 2 (12.5%)
Importance of regular follow-up for hypertensive patients	<ul style="list-style-type: none"> ▪ Ask the patient for regular follow-up ▪ Need health education in every follow-up visits ▪ Need to change the treatment plan in follow-up visits 	<ul style="list-style-type: none"> ▪ 15 (94%) ▪ 13 (72%) 	<ul style="list-style-type: none"> ▪ 1 (6%) ▪ 5 (28%)

Table 2: Knowledge and practice of non-physicians at primary health care towards standard management of hypertension.

2-8 mmHg reduction can be achieved by decreasing dietary sodium and 4-9 mmHg by physical activity.⁹ Most of physicians agreed on the important of lifestyle modification as measure for preventing or delaying of the onset of hypertension and its complications, this because most of them identified correctly all the risk factors of hypertension.

In addition, most of the physicians have good skills on standard management of hypertension, good knowledge on investigations needed, and referral criteria to high facility levels, and they could arrange other means of transportation for referral if ambulance was not available.

In addition, most of the care providers considered that regular follow-up of the patients to assess the efficacy of the prescribed drugs, to detect the effectiveness of the treatment plan, and to raise the patient's awareness on hypertension by continuous health educations is very important procedure for proper management of hypertension.

For non-physicians, most of them could not identify important items for the standard measurement technique of

blood pressure and this result can be considered as a negative indicator for the quality of hypertension management, because proper measurement of blood pressure plays an important role in diagnosis and control of hypertension.¹⁰

On the other hand, big number of them identified only hypertensive cardiac damage and brain damage respectively, but only small group of them knew hypertensive vascular damage-which affects the eyes and hypertensive renal damage respectively.

In addition only small number of them agreed on the important of lifestyle modification as measure for preventing or delaying of the onset of hypertension and its complications, and so on some of the modifiable risk factors (physical inactivity, dyslipidaemia and alcohol consumption), these results can be considered as negative indicators, as hypertension can be prevented and control by lifestyle modification through prevention of the risk factors.

However, such difference in the knowledge between physicians and non-physicians partially can be attributed to the

contents and quality of in-service training on hypertension management and partially may be due to the difference on the basic educational training between the two groups of care providers.

In conclusion, the study revealed marked gaps in the knowledge domain of non-physicians, such as the standard management of hypertension, the proper measurement of blood pressure; lifestyle modification and serious complications of hypertension and thus in-service training is recommended for both physicians and non-physicians, and basic training is another important need for non-physicians.

ETHICAL CLEARANCE

An ethical approval was obtained from the Sudan Medical Specialization Board (SMSB), and verbal consent was obtained from each health care provider prior to the interview.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

REFERENCES

1. World Health Organization. Report on the Regional Consultation on Hypertension Prevention and Control (Abu Dhabi, United Arab Emirates, 20-22 December 2003), WHO-EM/NCD/042/E. Cairo, Egypt: Regional Office for the Eastern Mediterranean; 2004.
2. Federal Ministry of Health. Sudan Household Health Survey (SHHS) 2010, chronic diseases results. 2010. Website. <http://www.fmoh.gov.sd>. Accessed September 26, 2016.
3. Federal Ministry of Health. Annual health statistical report 2008. 2008. Website. <http://www.fmoh.gov.sd>. Accessed September 26, 2016.
4. Chobanian AV, Bakris GL, Black HR, et al. Seventh report of the Joint National Committee on prevention, detection, evaluation and treatment of high blood pressure. *Hypertension*. 2003; 42(6): 1206-1252. doi: [10.1161/01.HYP.0000107251.49515.c2](https://doi.org/10.1161/01.HYP.0000107251.49515.c2)
5. Nicholas DD, Heiby JR, Hatzell TA. The quality assurance project: Introducing quality improvement to primary health care in less developed countries. *Qual Assur Health Care*. 1991; 3(3): 147-165. doi: [10.1093/intqhc/3.3.147](https://doi.org/10.1093/intqhc/3.3.147)
6. Roemer MI, Montoya-Aguilar C. Quality assessment and assurance in primary health care. *WHO Offset Publ*. 1988; 105: 1-78. Web site. <http://www.ponline.org/node/380816>. Accessed September 26, 2016.
7. Donabedian A. The definition of quality and approaches to its assessment. *Explorations in Quality Assessment and Monitoring*. Ann Arbor, MI, USA: Health Administration Press; 1980: 5-6.
8. Brown LDP, Miller Franco L, Rafeh N, Hatzell T. Quality assurance of health care in developing countries. *Quality Assurance Methodology Refinement Series*. Bethesda, MD, USA: Quality Assurance Project; 1998.
9. US Department of Health And Human Services (National Institutes of Health, National Heart, Lung, and Blood Institute, National High Blood Pressure Education Program). The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. NIH Publication No. 04-5230, 2004. Web site: <http://www.nhlbi.nih.gov/files/docs/guidelines/jnc7full.pdf>. Accessed September 26, 2016.
10. Osman EM, Suleiman I, Elzubair AG. Patients knowledge of hypertension and its control in Eastern Sudan. *East Afr Med J*. 2007; 84(7): 324-328. Web site. <http://www.ajol.info/index.php/eamj/article/view/9587>. Accessed September 26, 2016.