Awareness of Neglected Tropical Diseases Among Medical and Health Sciences Students at King Abdulaziz University, Jeddah: A Cross-Sectional Study

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ABSTRACT

Background: Neglected tropical diseases (NTDs) are chronic illnesses that affect people worldwide, especially the poor. Infection prevention and control is cost-effective and long-term by raising NTD awareness. Few studies have examined healthcare providers' knowledge of these infections and parasitic origin diseases in developing and developed countries, as well as in Saudi Arabia.

Objectives: To assess medical and health sciences students' awareness of neglected tropical diseases (NTDs) with parasitic origins at King Abdulaziz University in Jeddah.

Methods: From February to June 2022, King Abdulaziz University conducted a cross-sectional descriptive survey of 201 medicine and health sciences students. Questions covered NTD awareness, control, and participation. Categorical factors were presented as percentages and frequencies in statistical analysis.

Results: The study had roughly equal male and female student participation. Over half of the students didn't know what NTDS was or that Saudi Arabia had NTDs. NTDs were a public health issue in Saudi Arabia, but only 6% of students had seen them. Most Saudi students didn't know about entity control actions.

Medical and health students don't understand NTDs or their treatment. Saudi Arabia's health system may be strained by imported diseases due to this gap. Therefore, medical and health sciences students must be educated about NTDs.

Keywords: **Neglected Tropical diseases (NTDs), Awareness, Parasitic infections, Parasites**

INTRODUCTION

Neglected tropical diseases (NTDs) are a collection of chronic parasitic, bacterial, viral and fungal illnesses[1,2]. WHO listed 20 diseases as NTD's that are mostly prevalent in the tropical and subtropical regions[3,4] where most of low-income populations reside[5]. It is believed that Sub-Saharan Africa accounts amongst more than 90% of the cumulative obtained by neglected illnesses in terms of death and disability[6]. It's widespread in these regions are due to the lack of proper sanitation and health care facilities[7]. Infections with NTDs have a massive impact on individual's wellbeing; such as socioeconomic issue burden and child development[8]. NTDs may also cause permanent impairment limiting diseased individual's ability to work[9,10]. The global prevalence of NTDs is estimated to be at 1.2 billion, with approximately 534,000 deaths occurring each year[8,11,12]. Thus, NTDs burden maybe higher than infections caused by malaria and tuberculosis[9]. NTDs impact the lowest income communities and lead to a continuum of poverty due to diminished productivity triggered by long-term disease, disability, and social consequences[13,14].

Twelve of these NTDs are caused by parasitic illnesses, and these include food-borne trematodiasis, African trypanosomiasis (sleeping sickness), leishmaniasis, lymphatic filariasis, onchocerciasis (river blindness), schistosomiasis (bilharzia), Chagas disease, taeniasis/cysticercosis, Dracunculiasis (guinea worm disease), echinococcosis, soil-transmitted parasitic worms (ascariasis, trichuriasis, and hookworms), and scabies and other ectoparasites[2,5].

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For the religious rituals of Hajj and Umrah, people travel from all over the world to Saudi Arabia. Additionally, people come to the nation in search of employment and business opportunities. Muslims from tropical nations including Pakistan, India, Bangladesh, and Indonesia commonly travel for religious purposes. Also, from African nations where NTDs are prevalent, such as Nigeria and Sudan[15].

Nowadays, Saudi Arabia is becoming of tourism attraction to many visitors from around the globe including visitors from tropical and subtropical endemic disease areas. Thus, strengthening the healthcare system through implementing knowledge on NTD's that are usually not prevalent in the country among health staff is of necessity. In order for the healthcare provider to correctly diagnose and treat patients arriving from endemic areas.

Hence, there is an urgent demand for development of further comprehensive NTD's awareness and knowledge programs targeted for healthcare providers in the Kingdom.

The knowledge and awareness of physicians and nurses about NTDs plays a vital role in the control of these diseases. To our knowledge, there have been no studies investigating the knowledge and awareness of NTD's among medical and health sciences students in Saudi Arabia. Thus, this study is aimed in assessing knowledge and awareness of NTD's, focusing of parasitic origins among students of medical and applied health sciences background at King Abdulaziz University in Jeddah city.

MATERIALS AND METHODS

Research Method: The ethical approval for this cross-sectional study was obtained from the unit of biomedical ethics, Research Ethics Committee (REC) NCBE Registration No: (HA-02-J-008) at King Abdulaziz University (Reference No 140-22). Using a questionnaire created by Elfar E, *et al*.,[16] this study was carried out on student participants in the health and medical sectors at King Abdulaziz University from four distinct faculties: medicine, nursing, medical laboratory technology, and dentistry, between February and June 2022. The questionnaire was distributed electronically to undergraduate students and students' consent was at the beginning of it. This Questionnaire consists of close-ended 3-point queries (yes, no, or do not know) which was divided into two sections, the first section involves general questions (gender, faculty, academic year and Last year grade). While the second one consists of close-ended 3-point queries (yes, no, or do not know)[16], which included questions about general knowledge about NTDs, general knowledge about control activities, and readiness to participate in NTDs control measures.

Statistical Data Analysis: Data obtained was statistically analyzed through using Microsoft Office Excel. Categorical variables were revealed by using percentages and frequencies. This study applied the T-test to evaluate the relationship between different categorical variables, and a P-value of 0.05 was used to reject the null hypothesis.

RESULTS

Between February and June 2022, a survey was administered to students enrolled in the health and medical disciplines at King Abdulaziz University to ascertain their knowledge of neglected tropical illnesses (NTDs). There were 201 respondents in all, and there were about equal numbers of male and female respondents (50.6% & 49.3%) (Table 1). Four faculties of medicine and health sciences took part: dentistry, nursing, medical laboratory technology, and medicine. Notably, the majority of the participants were high achievers who received outstanding or very good ratings in their previous year's evaluations (49.3% and 28.9%, respectively) (Table 1).

More than half of the students who participated in the survey at King Abdulaziz University (KAU) in Jeddah, Saudi Arabia, were unaware of what NTDs are and do not know its definition (Table 2). Additionally, the course of parasitology and social media served as their primary sources of information (Table 2). The vast majority of students were incompetent that NTDs were of public health concern in Saudi Arabia, and just six percent of students had personally encountered someone who had NTD. The majority of students also believed that entity awareness is low in Saudi Arabia, indicating that students' total knowledge of NTD is inadequate (Table 3).

Finally, each student's faculty response data were separately analyzed (Table 4). However, no significant differences in responses were identified between the various disciplines of students (Table 4), demonstrating that a lack of knowledge is not limited to a particular sector but is a concern for all health and medical students.

Table 1: Characteristics of the KAU medical and health sciences students included in the study

Variable		Number (total=201)	%
Gender	Male	102	50.7
	Female	99	49.3
Faculty	Medicine	130	64.7
	Nursing	32	15.9
	Medical technology	31	15.4
	Dentistry	8	4
Academic year	Year 2	80	39.8
	Year 3	42	20.9
	Year 4	47	23.4
	Year 5	6	3
	Year 6	13	6.5
	Intern	13	6.5
Last year grade	Excellent	99	49.3
	very good	58	28.9
	Good	34	16.9
	Poor	10	5

Table 2: Knowledge and awareness of NTDs among KAU's medical and health science students

Variable		Number (total=201)	%
Do you know the meaning of NTDs (neglected tropical diseases)?	Yes	56	27.9
	Not sure	39	19.4
	No	106	52.7
Have you heard of NTDs in Saudi Arabia?	Yes	20	10
	Not sure	65	32.3
	No	116	57.7
Where did you hear about NTDs?	Social media	68	33.8
	Parasitology or Microbiology course	57	28.4
	Scientific journal	24	11.9
	Conferences/ Meeting	12	6
	TV/Radio	9	4.5
	Faculty Library	8	4
Do you think NTDs constitute a problem of Public health importance in Saudi Arabia?	Yes	69	34.3
	Not sure	104	51.7
	No	28	13.9
Have you ever seen someone affected by NTD?	Yes	12	6
	Not sure	77	38.3
	No	112	55.7
Which of the following is NTD?	Buruli ulcer	14	7
	Chagas disease	17	8.5
	Dracunculiasis	16	8
	Human African Trypanosomiasis	13	6.5
	Leishmaniasis	19	9.5
	Leprosy	24	11.9
	Lymphatic Filariasis	12	6
	Trachoma	13	6.5
	Schistosomiasis	35	17.4
	Onchocerciasis	19	9.5
	Soil-transmitted helminthiasis	19	9.5

Table 3: Knowledge of NTD prevention and control methods within KAU medical and health science students

Variable		Number (total=201)	%
Do you know about specific NTDs control activities?	No	116	57.7
	not sure	54	26.9
	Yes	31	15.4
Are you willing to participate in control activities for NTDs?	Yes	82	40.8
	Not Sure	70	34.8
	No	49	24.4
Do you think that awareness of NTDs is poor in Saudi Arabia?	Yes	124	61.7
	not Sure	65	32.3
	No	12	6

DISCUSSION

Neglected Tropical diseases are a group of chronic infections, bacterial, parasitological, viral, and fungal, that can affect populations, especially in developing countries[17]. Due to the lack of knowledge and awareness of NTDs control, engaging the public in the control activities of NTDs and improving their understanding of NTDs is needed[16,18]. In Saudi Arabia, there is a lack of studies discussing the awareness of NTDs and how much the public and students know about them. This cross-sectional study was done among medical field students at King Abdulaziz University to assess their awareness level regarding NTDs. It also addressed their perceived role in controlling NTDs. An overview of this assessment was based on the belief that knowledge of NTDs should be introduced and developed during specialty training in the medical and health sciences. The study's awareness assessment findings highlight the necessity of providing medical and other health sciences students with systematic instruction on NTDs and related preventive measures.

This study was conducted on nearly equal numbers of males and females and showed that a low percentage of students knew about NTDs, and even a lower rate (6.5-17.9 %) could relate names of pathogens to NTDs. Moreover, most students have not heard of NTDs and do not know their meaning. The lack of epidemiological information on NTDs is consistent with the analysis of their source of

Table 4: Comparison between the included medical and health sciences students' awareness and knowledge of NTDs at KAU

Variable		Excellent	very good	good	poor	P-value
Do you know the meaning of NTDs (neglected tropical diseases)?	Yes	28	20	7	1	0.75244
	not sure	19	7	10	3	
	No	52	31	17	6	
Have you heard of NTDs in Saudi Arabia?	Yes	11	5	3	1	0.397378
	not sure	28	23	8	6	
	No	60	30	23	3	
Where did you hear about NTDs?	Social media	26	16	15	3	0.708433
	Epidemiology or Microbiology course	31	11	6	5	
	Scientific journal	12	5	7	0	
	Conferences/ Meeting	8	3	1	0	
	TV/Radio	4	4	0	1	
	Faculty Library	2	5	1	0	
Do you think NTDs constitute a problem of Public health importance in Saudi Arabia?	Yes	38	18	11	2	0.63107
	not sure	48	33	17	6	
	No	13	7	6	2	
Have you ever seen someone affected by NTD?	Yes	6	4	1	1	0.136473
	not sure	39	16	15	7	
	No	54	38	18	2	
Do you know about specific NTDs control activities?	Yes	16	10	4	1	0.268337
	not sure	24	14	8	8	
	No	59	34	22	1	
Are you willing to participate in control activities for NTDs?	Yes	45	20	14	3	0.092874
	Not Sure	38	16	10	6	
	No	16	22	10	1	
Do you think that awareness of NTDs is poor in Saudi Arabia?	Yes	67	39	13	5	0.092461
	not Sure	26	15	19	5	
	No	6	4	2	0	

information, as only 28.4% of them gained knowledge about NTDs through parasitology or microbiology courses. This lack shows that the phrase "NTDs" might not be expressly addressed in these courses' materials or specifications. Moreover, 33.8% of students learned about NTDs from social media rather than their medical courses. It supports that more elaboration on NTDs needs to be covered in these courses. A similar study done in Egypt had a similar conclusion regarding the gap in NTDs' knowledge and the depth of covering the epidemiology of these diseases in medical courses[16]. It is concerning that most participants completed their microbiology and parasitology courses with an insufficient epidemiological understanding of NTDs. Another study in Peru concluded that participating in clinical training, research, and publication improved students' knowledge about NTDs[19].

Only 6% of students in the current study had seen an individual affected by NTD, and the majority were unaware of whether NTDs might have a public health impact in Saudi Arabia. It also showed that most of the students were unaware of the control activities of NTD, and in general, the awareness was low among them. On the other hand, a study conducted to measure NTDs awareness among medical students in Egypt showed that only 26% of medical and nursing students knew about NTDs, while (74%) did not know the meaning of NTDs[16]. Moreover, 48% think the awareness of NTDs is poor in Egypt[16]. Also, the study presented that only 33% of the students agreed that NTDs could have a health impact in Egypt, although NTDs represent a significant issue for Egypt's public health[16]. In contrast, another study performed in Nigeria to evaluate public awareness and knowledge of NTDs control activities documented that around 73.1% of the public had heard about NTDs, and 63.1 % had good knowledge about them[20]. Moreover, another study in Nigeria among primary healthcare workers showed that most have good knowledge about NTDs (57%)[21]. According to a study done in Haiti, compliance with control and management guidelines could positively impact public awareness of NTDs, their transmission route, mass drug distribution, expected counter effects of these implementations and population appraisal of risk factors[22].

Regarding the percentage of the genders participating in our study, Moreover, regarding students' achievement in their previous year, in our research, most of the students had high grades, either excellent or very good. These results agree with the study in Egypt, where most of the students had good grades, either excellent or perfect[16].

The study's limitations included its small sample size and the percentage of respondents from each college who were currently enrolled. It would be important to clearly understand the awareness and knowledge of

NTDs among Saudi Arabian health science students with a larger sample size and the inclusion of other universities.

CONCLUSIONS

In conclusion, there is an apparent lack of knowledge among medical and health students regarding NTDs and their control. This gap might comprise a great challenge, especially for a country like Saudi Arabia, where imported infections, if not carefully contained, might exert a burden on the health system. Therefore, teaching NTDs is crucial for medical and health sciences students. Thus, updating curricula for courses like epidemiology, microbiology, and parasitology is essential. Details regarding NTDs, their epidemiology and control must be integrated into these courses and their training practices. Medical, Applied Medical Sciences and Nursing schools should provide additional opportunities for students to participate in NTDs-related research, training, and community services. It is advised to continuously assess the ongoing activities in training and research to maximize their advantages. It might be helpful to repeat the study on other medical field students from different parts of the country using focus groups discussion and individual interviews to draw a broader conclusion on the perception of medical field students of NTDs in the country.

Ethical Considerations: This study was certified by the unit of biomedical ethics, Research Ethics Committee (REC) NCBE Registration No: (HA-02-J-008) at King Abdulaziz University (Reference No 140-22). The study followed Declaration of Helsinki, 2013.

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REFERENCES

1. Hotez PJ, Bottazzi ME, Franco-Paredes C, et al. The neglected tropical diseases of Latin America and the Caribbean: a review of disease burden and distribution and a roadmap for control and elimination. PLoS Negl Trop Dis 2008;2(9):e300.
2. Mitra AK, Mawson AR. Neglected Tropical Diseases: Epidemiology and Global Burden. Trop Med Infect Dis 2017;2(3):36.
3. WHO. Control of Neglected Tropical Diseases 2022 15 December. (2022). https://www.who.int/neglected_diseases/diseases/en/..
4. Bodimeade C, Marks M, Mabey D. Neglected tropical diseases: elimination and eradication. Clin Med 2019;19(2):157-60.
5. Hotez PJ, Fenwick A, Ray SE, et al. Rapid impact 10 years after: The first "decade" (2006-2016) of integrated neglected tropical disease control. PLoS Negl Trop Dis 2018;12(5):0006137.
6. Liu L, Johnson HL, Cousens S, et al. Global, regional, and national causes of child mortality: an updated systematic analysis. Lancet 2010;379(9730):2151-61.
7. Norris J, Adelman C, Spantchak Y, et al. Social and Economic Impact Review on Neglected Tropical Diseases. Hudson Institute, Washington, DC; 2012.
8. Mackey TK, Liang BA, Cuomo R, et al. Emerging and reemerging neglected tropical diseases: a review of key characteristics, risk factors, and the policy and innovation environment. Clin Microbiol Rev 2014;27(4):949-79.
9. Hotez PJ, Fenwick A, Savioli L, et al. Rescuing the bottom billion through control of neglected tropical diseases. Lancet 2009;373(9674):1570-5.
10. Bhutta ZA, Sommerfeld J, Lassi ZS, et al. Global burden, distribution, and interventions for infectious diseases of poverty. Infect Dis Pov 2014;3:21.
11. Barreto SM, Miranda JJ, Figueroa JP, et al. Epidemiology in Latin America and the Caribbean: current situation and challenges. Int J Epidemiol 2012;41(2):557-71.
12. Hotez PJ. One world health: neglected tropical diseases in a flat world. PLoS Negl Trop Dis 2009;3(4):e405.
13. Manderson L, Aagaard-Hansen J, Allotey P, et al. Social research on neglected diseases of poverty: continuing and emerging themes. PLoS Negl Trop Dis 2009;3(2):e332.
14. Molyneux DH, Hotez PJ, Fenwick A. Rapid-impact interventions: how a policy of integrated control for Africa's neglected tropical diseases could benefit the poor. PLoS Med 2005;2(11):e336.
15. Almutairi MM, Alsalem WS, Hassanain M, et al. Hajj, Umrah, and the neglected tropical diseases. PLoS Negl Trop Dis 2018;12(8):0006539.
16. Elfar E, Asem N, Yousof H. The awareness of neglected tropical diseases in a sample of medical and nursing students in Cairo University, Egypt: A cross-sectional study. PLoS Negl Trop Dis 2020;14(11):0008826.
17. Gutman JR, Lucchi NW, Cantey PT, et al. Malaria and Parasitic Neglected Tropical Diseases: Potential Syndemics with COVID-19? Am J Trop Med Hyg 2020;103(2):572-7.
18. World Health Organization. Neglected tropical diseases: impact of COVID-19 and WHO's response - 2021 update. 2021;96(1):461-8.
19. Villafuerte-Galvez J, Curioso WH, Miranda JJ. The role of medical students in the fight to control neglected tropical diseases: a view from Peru. PLoS Negl Trop Dis 2008;2(9):e292.
20. Olamiju OJ, Olamiju FO, Adeniran AA, et al. Public awareness and knowledge of neglected tropical diseases (NTDs) control activities in Abuja, Nigeria. PLoS Negl Trop Dis 2014;8(9):e3209.
21. Emeto DC, Salawu AT, Salawu MM, et al. Recognition and reporting of neglected tropical diseases by primary health care workers in Ibadan, Nigeria. Pan Afr Med J 2021;38:224.
22. Lemoine JF, Desormeaux AM, Monestime F, et al. Controlling Neglected Tropical Diseases (NTDs) in Haiti: Implementation Strategies and Evidence of Their Success. PLoS Negl Trop Dis 2016;10(10):0004954.