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University of Health Sciences
Bosaso-Puntland, Somalia

SCOPE OF THE JOURNAL

» The Scientific Journal of the University of Health Sciences (Sci. J. UOHS) is a biennial and aims to report the scientific work produced within the university. However, results of other researchers within Somalia and outside of the country that report work of scientific relevance in the health field may be accepted and published in the journal.

» Another objective of this journal is to be a platform not only for our researchers to present their research results but also to encourage our graduating students to compete for publishing in this journal the important results of their research thesis work. A selected number of research thesis works of merit might be considered for publication.

» A third objective is to stimulate and motivate our young scientists to conduct research activities within the university and therefore learn and improve the art of both experimental and theoretical research activities.

» Mini reviews and scientific comments on topics of interest in the health field and related areas may be considered for publication in this journal.

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AUTHOR GUIDELINES

A. Format and style

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- **Title:** should be as brief as possible, including spaces. Authors and their affiliation institutions indicated by superscript numbers should be listed below the title on the first page of the manuscript.
- **Abstract:** the abstract should present brief background information on the topic in question, methods, results, and conclusions. The abstract should not exceed 300 words and should not contain citations, or unexplained abbreviations.
- **Keywords**: 3-5 keywords must be written on a separate line below the abstract.
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For investigations on humans, a statement indicating informed consensus should be included. Plagiarism of any kind is not acceptable and should be avoided.

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Submit the manuscript to the secretary of the scientific journal committee, Hawo Yusuf, e-mail: yhawa3464@gmail.com

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DEDICATION

We dedicate this first volume of the Journal to Professor Abdirizak Hussein Hassan. Every project starts with an idea, and founding this journal began with the late Professor Abdirizak Hussein Hassan, the founder of UOHS, who was very passionate about the realization and foundation of the Journal.

The late Professor Abdirizak Hussein was an exemplary leader. Following the breakout of the Somali civil war, most of the elites and brains of the nation emigrated to other countries. The late Professor was among the few of his calibre who remained behind and struggled against the deteriorating situation of his home nation. He feared the country might face brain drainage.

A tragic medical case he witnessed in Bender Qassim Hospital in 1998, and upon reflecting on the scarcity of medical personnel prompted the Professor even harder to act against the declining health trends in our country before the situation got worse; he decided to establish a Nursing Institute, the first of its kind in Puntland to produce paramedics to serve in every corner of Somalia. Thanks to his efforts, the medical human resource crisis has significantly improved due to the increasing number of health sciences graduates from UOHS and similar institutions.

The Professor was a highly talented hard worker, who combined his unique leadership skills and determination to execute his duties for the people so that they might realise their dreams and reach far-reaching objectives, He is no longer with us now, but his inspirations are still the driving force of many activities at the University such as this journal. May Allah SWT have mercy on him and Grant him the highest levels of paradise.

EDITORIAL NOTE

Dear Colleagues and Readers,

For some time, the leadership of the University of Health Sciences has been discussing the need to establish a scientific journal that reports the scientific work performed at the institution. Finally, a committee was appointed on 31st October 2021 to put the basis for the establishment of a scientific journal for the University of UOHS. We are pleased to present and launch the first volume of the journal "Scientific Journal of the University of Health Sciences). It has not been an easy task, but we are pleased that the first volume is now ready in print and online in April 2024. This first volume contains seven articles, one mini review and a commentary article.

A relevant objective of the foundation of this journal is to act as a platform for our young researchers to publish their research results, but also scientific work performed in other institutions in the country and outside of the country may be accepted for publication in the journal provided that the results reported are of relevance in the health or related areas. Another relevant goal of this journal is motivating and encouraging our academic staff to pursue and carry out research activities at the University; the publication of preliminary results allows young researchers to learn and improve the art of experimental and theoretical research activities. Thus, the journal aims to play a significant role in developing the writing skills of young scientists so that, very shortly, they become confident in publishing their research works in internationally refereed scientific journals of their fields of interest.

Finally, it is known that the principal goal of a university is teaching and research, thus providing a public service. The importance of research hardly needs to be stressed. Research helps us gain new knowledge and new applications, creates wealth and jobs, and enriches our cultural life. While many universities in Somalia do their best to prepare professionals, research activities in the scientific area have not yet taken off the ground. We do hope that this journal will pave the way for our young scientists to stimulate and ignite their interest in scientific research endeavours so that, through their creative effort, they play important roles in the development and progress of our country.

EVALUATION OF FOOD INSECURITY IN BOSSASO CITY

CAUSES, & PLAUSIBLE SOLUTIONS

Amina Abdirahman & Ahmed M. Osman

ABSTRACT

Food insecurity is related to a lack of availability and accessibility to food products and remains a threat in many parts of the world. This study focuses on food insecurity in Bossaso City, the principal commercial city of Puntland. The research method selected for assessing the food insecurity of the city was the interviewing and questionnaire method of collecting data from two main categories of the food business field. The first category was the major five companies of food importers in Bossaso and the other category was fifty food retailers. The findings of the study revealed that there is food insecurity in Bossaso District. The five major food importers agreed on the unavailability of some stable food products in the city. The main reason for food insecurity in Bossaso was limited seaport space, resulting in major cargo container ships not arriving at the Bossaso seaport.

Other factors causing food insecurity include high taxation on food items derived from the passage of the containers at different ports and the high prices of food items in the exporting countries. The retailers consisting of both male (78%) and female (22%) respondents, where most of them (36%) had a bachelor's degree, agreed with the big importers both on the existence of food insecurity in Bossaso and the reasons causing it. Seventy-four percent of the retailers strongly agreed that the main cause is the limited space of the seaport. Further, 86% stated that the insufficiency of local food production contributes to food insecurity, whereas sixtyfour percent and 48% attributed poor governance and high taxation on food products, respectively. Also, the retailers pointed out the civil war and the lack of infrastructure for transportation as a factor.

In conclusion, the study unequivocally showed that there is food insecurity in Bossaso city and described the main reasons causing it and the plausible solutions to these food challenges.

Keywords:
Food insecurity; Seaport space; Food importers; High taxation; Bossaso city

1. INTRODUCTION

Food insecurity is defined by the World Food Organization (FAO) as follows: *"A situation that exists when people lack secure access to sufficient amounts of safe and nutritious food for normal growth and development and cannot lead an active and healthy life [1]. Alternatively, food insecurity can be defined as, "The limited or uncertain availability of nutritionally adequate, safe foods or inability to acquire foods in socially acceptable ways"* [2].

Food insecurity is one of the main causes of morbidity and mortality worldwide. It is a frequent problem in both developed and developing countries. Indeed, more than 850 million people face food insecurity, which makes food insecurity one of the priority issues in every nation. Food insecurity is often rooted in poverty and has long-term impacts on the ability of families, communities, and countries to develop and prosper in life. Prolonged undernourishment stunts growth, slows cognitive development, and increases susceptibility to illness. Food insecurity reflects the accessibility and availability of healthy, nutritious food items. Culturally appropriate food is an important indicator of whether people in a community are at risk of hunger, starvation, unhealthy eating, and a host of potential negative consequences, such as malnutrition, obesity, diabetes, and poor physical, cognitive, and psychological development [1].

In Somalia, after a gradual recovery from the food insecurity and famine of 2011, the country's food security is again under threat. The situation worsens in rural areas following consecutive seasons of poor rainfall and low river water levels. These

have resulted in near-total crop failures, reduced rural employment opportunities, and widespread shortage of water and pasture with consequent increases in livestock deaths. As local staple food prices continue to rise sharply and livestock prices decrease significantly, access to food is rapidly weakening among the poor. According to Food Security and Nutrition Analysis Unit-Somalia (FSNAUS) June 2020-January 2021 Report [3], the economic impact of COVID-19, combined with the less rainfall and locust upsurge in the country worsened the food insecurity situation in Somalia [3]. It is estimated that about 2.7 million people need food assistance [3].

Though Somalia has a long-standing food shortage because of the lack of enough local food production and because the country is dependent on imported food products, not enough information is available on the gravity of food insecurity, especially in Bossaso city, the principal commercial city of Puntland and one of the main business cities in Somalia. Thus, the present study investigated whether or not there is food insecurity in Bossaso, the types of food insecurity, the main reasons causing it, and the possible solutions for reducing these food insecurity challenges.

2. RESEARCH METHODOLOGY

2.1. Study area

This study was conducted in Bossaso city, the capital city of Bari region, Puntland State (Somalia). Bossaso is Puntland's main commercial city and is located on the southern coast of the Gulf of Aden and the Red Sea. It has the most important seaport in the Puntland state. Historically, Bossaso was known as Bender Qassim and has an estimated population of about 750,000.

2.2. Study design

This investigation was carried out by combining interview and questionnaire approaches to collect information about food insecurity in Bossaso city. The target group for the present research consisted of two groups. The main group was the five principal food importers. These companies are the relevant companies that import food not only in Puntland but also in other parts of our country. The second group consisted of 50 randomly selected food retailers in Bossaso. We did face-to-face interviews with the executives of the five largest food importing companies in Puntland on the level of food insecurity in Bossaso city. The face-to-face interview permitted the interviewer to get in-depth information. A questionnaire survey was used to gather additional data from a good portion of food retailers in Bossaso for comparison reasons against the results obtained from the principal food importers. The research and the data collection were carried out between November 2020 and May 2021.

2.3. Data analysis

The data collected was analyzed by using the computer program SPSS.

3. RESULTS

Food insecurity in Bossaso city, causes, and suggested solutions

Table 1 reports the names of the five major food importers, their experience in the field of food, and their views on food insecurity in Bossaso city. The companies all agree on the existence of food insecurity in the city. These unavailable products are mainly stable foods. However, one of them stated that these foods, though missing, can be replaced (Table 1). Also, the importers all agree on the strong

relationship between rising food prices and food insecurity. Some foods are available but not accessible. An example of the latter is fish (Table 1).

Table 1. Food insecurity in Bossaso city according to the major importers of food items

The five major importers of food items	The years of experience	Is there food insecurity in Bossaso city?	Are there food products not available in the city?	Name these food products	Does rising price affect food insecurity?	Are products available but not accessible?
Tawfiiq	about 30	Yes	Yes	I do not recall all now	Strong relationship	Yes (e.g., fish)
Saabir	17 years	Yes	Yes	Basic foods	Strong relationship	Yes
Tibco group	26 years	Yes	Yes	Basic foods	Is the major factor causing food insecurity	Yes
Waafi group	25 years	Yes	Yes	Quality foods	Strong relationship	Yes
Mutawafaq	26 years	Yes	No	If missing, they can be replaced.	Strong relationship	Yes

As for the reasons for the unavailability of some basic foods in the city, the importers attributed limited seaport space, lack of major cargo containers, transportation costs, high prices of the products in the original country, limited customers, and the endemic disease of Covid-19, which of course affected trade and the communication among countries (Table 2). Further, the possible solutions to this food insecurity, as provided by the importers, are summarized in Table 2. These include the need to increase local agricultural food production, sound policy, and governance, including enlarging the seaport (Table 2).

Table 2. The reasons that account for the food insecurity in Bossaso and the suggested solutions

The Five major food importers	**The reasons that account for the lack of these food products**	**The strategies needed to solve these challenges**
Tawfiiq	• Few or no customers.	Create local food production
Saabir	• Small seaport space (cargo containers take longer to unload). • Lack of containers • The high price of foods imported	Improve sound governance. Create local food production
Tibco group	• Low income	Create local food production
Waafi group	• Covid-19 • Lack of cargo containers due to the small seaport space	Enlarge the seaport space
Mutawafaq	• The high price of foods in the countries of origin • High price during transportation expenses	Be aware of the products needed by customers & make sure that they are not interrupted

Background information of the whole retailers

To validate and compare the results obtained from the importers, questionnaire survey data were collected from randomly selected fifty whole retailers in the city. Most of the interviewed food retailers (78%) were of the male gender. The rest (22%) was female. Further, the age interval (46-65 years) was the highest in frequency (36%), and the lowest was the age group above 65 years. Regarding the educational levels of the food retailers, those holding a bachelor's degree represented the highest frequency (36%), whereas respondents with master's and illiterates were 4% and 6%, respectively.

Concerning the work experience of the retailers in their business field, most of them had more than four years of work experience in the food business. Few (4%) had less than one year of work experience. Furthermore, most of the retailers were married (64%).

Views of the food retailers on food insecurity in Bossaso city

When the food retailers were asked whether there was food insecurity in Bossaso, the answer was clear cut. Ninety-four percent answered affirmatively (Fig. 1). Most of them (54%) defined food insecurity as food unavailability (Fig. 2). But Only 8% did not answer that question (Fig. 2).

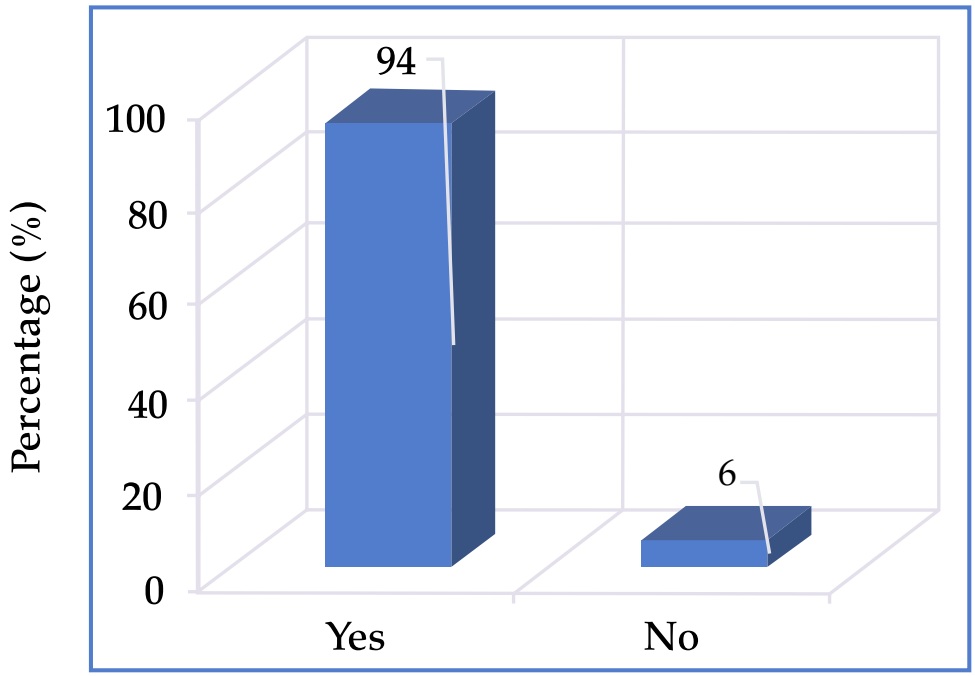

Figure 1. Views of the whole retailers to the question: Is there food insecurity in Bossaso?

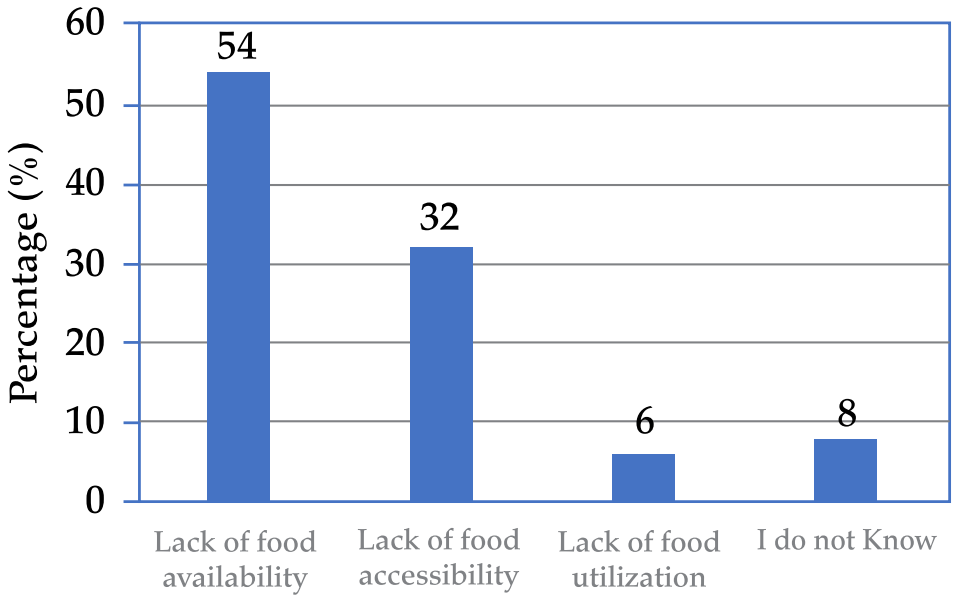

Figure 2. The types of food insecurity in Bossaso city

To the question, which types of food are missing? The retailers answered as reported in Figure 3. The most important type of nonavailable food items was the basic foods (56%) (Fig. 3).

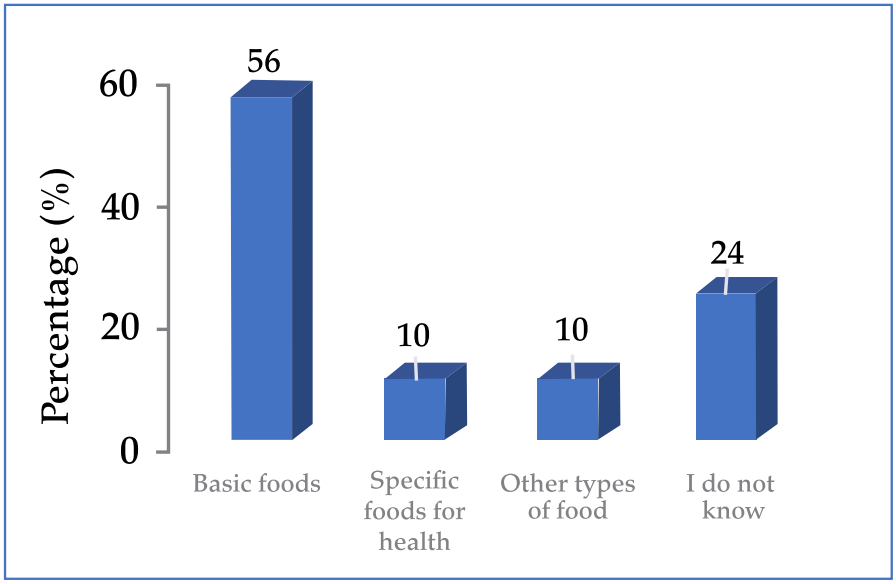

Figure 3. Types of food items missing in Bossaso city according to the retailers

The retailers attributed the food unavailability to the reasons reported in Figure 4, the most important of which is seaport congestion (40%).

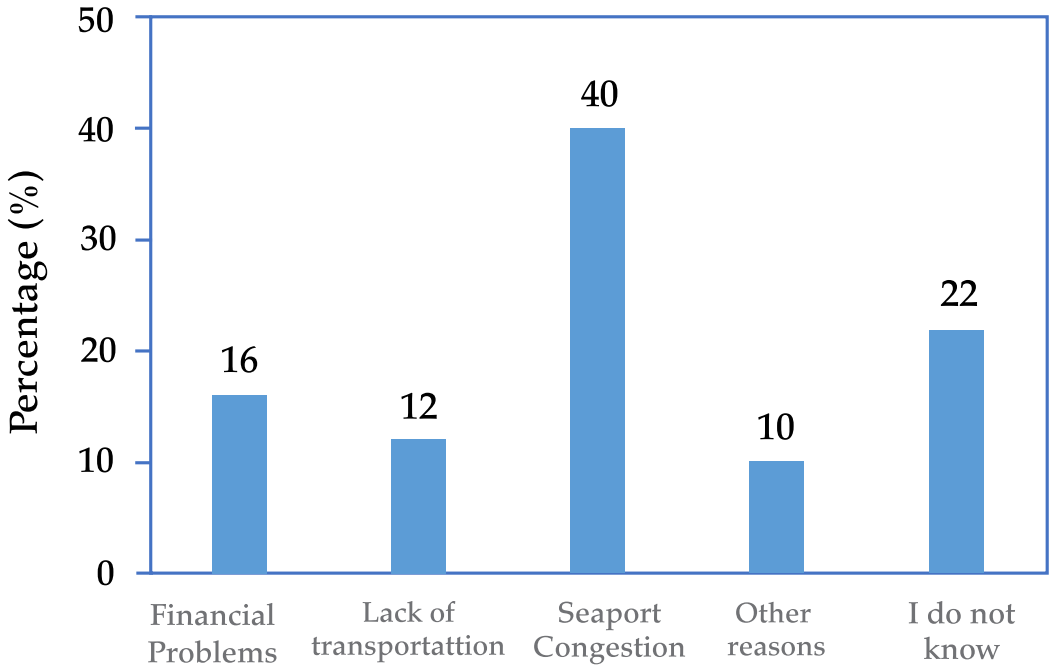

Figure 4. The reasons that cause food insecurity in Bossaso city according to the whole retailer.

In the opinion of the retailers, the other principal factors that contribute to food insecurity are the lack of local agricultural production, poor governance, high taxation on food items, the civil war, and lack of

Table 3. Additional factors that contribute to food insecurity in Bossaso city≠

Other factors contributing to food insecurity	Strongly disagree	Disagree	Agree	Strongly agree
Lack of local agricultural food production	2%	2%	10%	86%
Poor governance	6%	8%	54%	32%
High taxation on food items	8%	10%	34%	48%
Civil war and lack of infrastructure	6%	28%	60%	16%

≠ views of the retailers on the contributory role of these factors to the food insecurity in Bossaso city

4. DISCUSSION

Here, we investigated whether there is food insecurity in Bossaso city, the main commercial city of Puntland, which has one of the principal seaports in the country. To assess the issue of food insecurity in the city, we employed the combined interview and questionnaire survey approach to the principal protagonists in the food business in the city. These protagonists were two groups. One category consisted of the five major companies involved in food importation in Bossaso, and the other category consisted of fifty retailers implicated in the commercial business of food. The five relevant food importers unequivocally stated that there is food insecurity in Bossaso city and, in addition, pointed out the strong relationship between the rising price of food products and food insecurity in the city (Table 1). Some of the food products might be available but not accessible; this inaccessibility might be due to a lack of purchasing power and a lack of knowledge of the importance of the food item. An example of the latter case is fish (Table 1).

Upon the question of the reasons that caused the food insecurity in Bossaso city, the principal food importers unanimously agreed on the main factors responsible for the food insecurity (Table 2). One of the major obstacles is the limited space of the seaport (Table 2). It takes six cargo ships per month to unload their cargo. But 15 other ships may follow them in that same month, which means that these other later ships must wait for the unloading of the preceding ships (personal communication of some of the importers). This problem becomes more acute during the summertime because in the summer period, the Indian ocean is stormy and not calm, and that enforces ships directed to other destinations in the country, such as Mogadishu and Kismayo to come to Bossaso port for unloading their cargo, thus aggravating a situation already complicated. A second obstacle is that ships with big containers unload their cargo in Berbera city and not in Bossaso port due to the limited space. (Table 2). This limited space has a grave consequence as it increases taxation, which reflects in the food price. In other words, the food products will be taxed twice, first at Berbera and the second time at the Bossaso. A third obstacle is the high price of foods in the exporting countries (Table 2). These countries encounter climate problems, where lack of rain or calamities may lead to a shortage of food production. This limited food production reflects in the price of imported foods. Such events occurred in Egypt (wheat) and India (rice). Also, the absence of sound governance and a lack of local food production contribute to food insecurity (Table 2).

The retailers confirmed both the existing food insecurity in Bossaso city and the main reasons causing this food insecurity indicated by the big companies. Indeed, they confirmed that the limited space of the seaport is the principal cause of food insecurity (Fig. 4). Moreover, the retailers agree with the importers that the other main factors contributing to food insecurity include a lack of local food production, poor governance, high taxation on food items, the civil war, and the consequent lack of infrastructure (Table 3).

Finally, the key protagonists in the food business proposed plausible suggestions for overcoming the described challenges (Table 2). These included creating sound, good governance, expanding the limited space of the seaport, and increasing and putting effort into local agricultural food production.

Conclusion

In conclusion, this work revealed that there is food insecurity in Bossaso city, which reflects the situation in the rest of Somalia. The principal causes of food insecurity are the limited space on the seaport, high taxation, high prices of food in the exporting countries, the lack of local food production, and poor governance.

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INCIDENCE AND RISK FACTORS OF H. PYLORI INFECTION AMONG ADULTS IN BOSSASO, PUNTLAND (SOMALIA)

Mohamed Faisal Hussein and Saaid Said Jama

ABSTRACT

It is estimated that H. pylori infect 50% of the world's population. The infection is more common in developing countries. This study aims to assess the incidence and associated factors of H. pylori infection among adults in Bossaso, Puntland, Somalia.

A hospital-based cross-sectional study was conducted at Bossaso General Hospital between June and August 2019. We interviewed 100 adults using a structured interviewer-administered questionnaire and drew blood samples to test for H. pylori.

The study revealed that the overall incidence of H. pylori infection among the participants was 62%. Further, we found a higher incidence of H. pylori among females (37%), those living in a crowded area (70%), low-income status (68%), positive family history of H. pylori infection (68%), unemployment (65%), consumption of hot and spicy foods (48), regular use of NSAIDs (nonsteroidal anti-inflammatory drugs) (47%), and steroids use (40%).

We conclude that 62% of the participants had positive results. The relevant risk factors for H. pylori infection among adults in Bossaso include being a female, living in a crowded area, having low-income status, having a positive family history of H. pylori infection, and being unemployed. Also, nearly half of the respondents reported regular consumption of NSAIDs and hot and spicy foods.

Keywords:

H. pylori; Infection; Adults in Bossaso, Risk factors

1. INTRODUCTION

Helicobacter pylori (H. pylori) infection is common around the globe and infects about half of the world's population (1). H. pylorus is a gram-negative bacterium that colonizes the human gastric mucosa and causes chronic gastritis, peptic ulcer, gastric adenocarcinoma, and mucosa-associated lymphoid tissue lymphoma (2). Globally, H. pylori infection is more common than in developing nations, but there are regional variations. The estimated prevalence of H. pylori infection worldwide was 48.5%, although regional estimates varied widely by continent: 69.4% in South America, 37.1% in North America, 24.4% in Oceania, 54.6% in Asia, 47.0% in Europe, and 79.1% in Africa (3).

The main difference between developing and developed nations is that children in developing countries are far more likely to acquire H. pylori infection during childhood. Although it is yet unknown how H. pylori infection is transmitted, epidemiological and microbiological research has shown that both waterborne transmission and person-to-person transmission within the family occur (4). Several authors have highlighted the role of factors such as age, socio-economic status, poor sanitation and hygiene, crowded living conditions, smoking, use of a non-steroidal anti-inflammatory drug (NSAIDs), blood group O, high body mass index and family history of gastric disease in the acquisition and transmission of H. pylori (5).

No studies, to our knowledge, have been published on the prevalence and risk factors of H. pylori infection in Somalia. Thus, this study aims to assess the incidence and associated factors of H. pylori infection among adults in Bossaso, Puntland (Somalia).

2. RESEARCH METHOD

2.1. Study Design: Hospital-based cross-sectional study.

2.2. Study Setting: The study was conducted at Bossaso General Hospital, the only public hospital in Bossaso city, in June-August 2019. The city is in northeastern Somalia, on the Gulf of Aden coast, and it is the largest city, the economic capital, and an important seaport in Puntland state (Somalia).

2.3. Study population: adult patients who attended the department of Internal Medicine, Bossaso General Hospital during the study period. The sample size was 100 adults selected by using a convenient sampling method.

2.4. Inclusion & exclusion criteria: Adults patients with symptoms related to H. pylori infection who accepted participating in the study were included. Critically ill patients and those who refused to participate in the study were excluded.

2.5. Data collection and analysis: data was collected using a structured, interviewer-administered questionnaire, and blood samples were taken to test for H. pylori. Data were analyzed using the statistical package of social sciences (SPSS) version 20, described in terms of frequency, and presented using tables and charts as appropriate.

2.6. Ethical consideration: Ethical clearance was obtained from the University of Health Sciences. Informed consent was obtained from the study participants after explaining the study objectives. The respondents' responses would be kept confidential.

3. RESULTS

3.1. Socio-demographic characteristics of the participants

A hundred adults who attended Bossaso General Hospital during the study period were interviewed. Females represented 54% of the respondents, while males accounted for 45%. Regarding the age of the participants, 42% were in the age group of 18–25 years of age, 40% were in the age group of 25–35 years, and the remaining 18% were above 35 years of age. Half of the respondents were single, 26% were married, and the remaining 24% were divorced or widowed. Sixty-five percent of the participants were unemployed, while 35% were employed (Table 1). Concerning the level of education of the participants, 75% of them were literate, while the rest (25%) was illiterate (Table 1). Of the total respondents, 68% had a monthly income of less than 250 USD, 21% stated that their monthly income ranged between 250 and 500 USD per month, and only 11% of the participants had an income above 500 dollars per month (Table 1).

Table 1: Socio-demographic characteristics of the study participants

Characteristics	Percent (%)
Sex	
Male	46
Female	54
Age	
18-25	42
26-35	40
above 35	18
Marital status	
Single	50
Married	26
Divorced/Widowed	24
Employment	
Employed	35
un-employed	65
Education	
Cannot read or write	25
Literate	75
Monthly Income	
< 250 USD (US Dollar)	68
250-500 USD	21
> 500 USD	11

3.2. Risk factors of H. pylori infection

Furthermore, this study revealed that 68% of participants had a family history of H. pylori infection, while 32% had no family history (Table 2). Of the respondents, 47% regularly used NSAIDs; on the contrary, 57% did not, and 40% of them used steroid medications, whereas 60% did not. Most respondents (52%) did not consume hot and spicy foods regularly, while 48% did (Table 2). Concerning cigarette smoking and chewing of Qat, most participants were neither cigarette smokers (80%) nor Qat chewers (75%), while the remaining 20% and 25% were cigarette smokers and Qat chewers, respectively (Table 2). Most of the respondents (70%) were living in crowded places, while the remaining 30% of the participants were not (Table 2).

Table 2. Risk factors of H. pylori infection among the respondents

Risk factors	Percent (%)
Family history of H. pylori infection	
Yes	68
No	32
Regular NSAIDs use	
Yes	47
No	53
Use of Steroid medications	
Yes	40
No	60
Consumption of hot & spicy food	
Yes	48
No	52
Cigarette smoking	
Yes	20
No	80
Chewing Qat	
Yes	25
No	75
Living in a crowded place	
Yes	70
No	30

3.3.H. pylori incidence and its distribution by sex and age

Also, we found that 62% of the participants had positive results for H. pylori, while 38% had negative results (Fig. 1). Twenty-five % of those resulted positive were males and 37% were females, while 21% of males and 17% of females had negative results for H. pylori (Fig. 2).

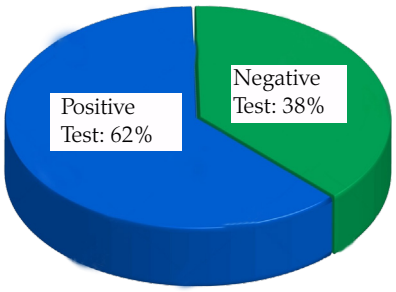

Figure 1. H. pylori incidence among the study participants

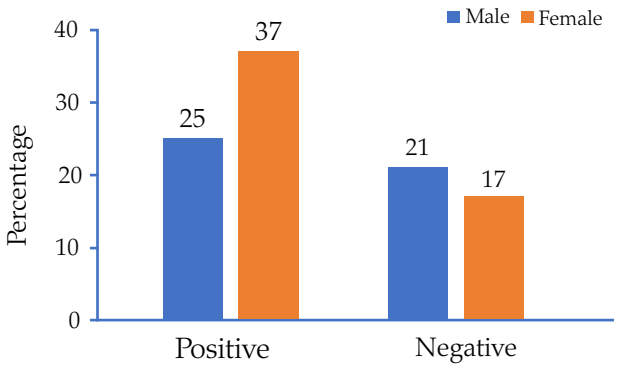

Figure 2. Sex distribution of H. pylori incidence

Finally, we found that the participants with positive H. pylori results were 23% in the age group of 18–25 years, 25% in the age group of 26–35 years, and 14% of them were over 35 years of age. Regarding the respondents with negative results, 19% of them were 18–25 years old, 15% were 26–35 years old, and the remaining 4% were over 35 years old (Fig. 3)

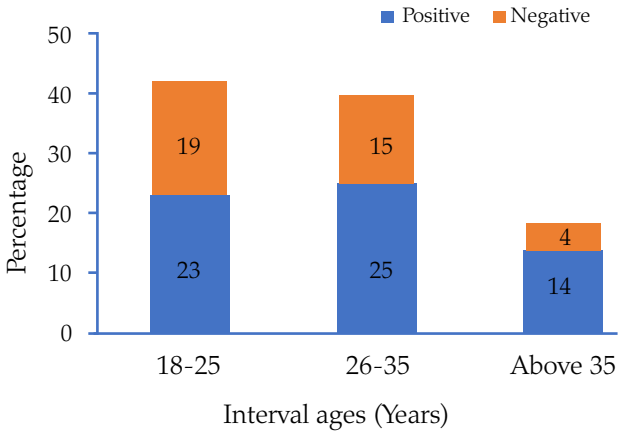

Figure 3. Incidence of H. pylori distribution by age

4. DISCUSSION

Our study revealed that most participants (62%) had positive results for the H. pylori test. This finding is lower than those results reported in the literature. For instance, the frequency was 72.2% in Ethiopia (6) and 66% in Kenya (7). In contrast, lower results (22.1%) were reported in Pakistan (8), 52.25% in China (9), 49.7% in Kuwait (10), and 29.4% in Canada (11). Differences in the personal habits and socio-economic status of the participants may explain the observed variations in prevalence.

Our results showed a higher incidence of H. pylori infection in females (37%) compared to males (25%). This finding is consistent with the results of previous studies carried out in Ethiopia, Kenya, and Turkey (12, 7, 13) but different from other studies conducted in Ethiopia (14) and Pakistan (15). One may attribute the sex prevalence variation to lifestyle and eating habit differences between sexes. Also, we found that the respondents with positive H. pylori results were 23% in the age group (18–25 years), 25% in the age group (26–35 years), and 14% over 35 years old.

In this study, most of the respondents (65%) were unemployed, and (68%) were of low-income status. Of the total of the study participants, 68% had a family history of H. pylori infection, 47% regularly consumed NSAIDS, 40% steroids, 48% were eating hot and spicy foods, and most of the respondents were non-smokers (80%) and non-Qat chewers (75%). In addition, most study participants (70%) lived in crowded places.

Conclusion

We found that 62% of the participants had positive results for H. pylori tests, with a higher percentage in females. The relevant risk factors for H. pylori infection are unemployment, low-income status, a positive family history of H. pylori infection, and living in a crowded area. Also, nearly half of the respondents regularly consumed NSAIDs and hot and spicy foods.

Recommendation

Further large-scale studies are needed to assess the incidence and risk factors of H. Pylori infection among adults in Bossaso.

Acknowledgement

The authors would like to thank the participants of the study, the administration of Bossaso General Hospital for their facilitation in conducting the study, and The University of Health Sciences.

Authors' contribution

Mohamed conceived, designed the study, and collected data. Saaid performed the data analysis and wrote the manuscript.

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KNOWLEDGE, ATTITUDE, AND PRACTICE TOWARDS FAMILY PLANNING AMONG WOMEN OF REPRODUCTIVE AGE IN BOSSASO, PUNTLAND (SOMALIA).

Ayaan Mohamed Mohamoud, Mariam Abdikadir Ali and Ahmed Isse Ahmed

ABSTRACT

Family Planning (FP), whose major component is contraceptive methods, is the main constituent of health services and benefits the health and well-being of women, men, children, families, and their communities. The widespread adoption of family planning represents one of the most dramatic changes of the 20th century. The growing use of contraception around the globe has given couples the ability to choose the number and spacing of their children with tremendous lifesaving benefits. This study focuses on assessing knowledge, attitudes, and practice of family planning among women of reproductive age in Bossaso (Somalia). The research method selected was a quantitative cross-sectional study. We found that most respondents have good knowledge about family planning (71.4%), while only 28.6% have poor knowledge. The distribution of the age intervals among the participants was 18.5 % (15-20 years), 35.2% (21-30 years), 34.9% (30-40 years), and the remaining 11.5% were in the range of (41- 49 years).

Furthermore, we found that most respondents believed family planning might negatively affect their health statuses, such as fertility, side effects of contraceptives, weight gain, and nausea. In conclusion, we have shown that most participants knew about the role and importance of family planning practices, though a significant part of the respondents did not. The study reveals the need to improve the know-how of reproductive-age women about the importance of family planning practices.

Keywords:

Family planning; Reproductive age; Knowledge, Attitude and Practice, Bossaso District.

1. INTRODUCTION

Family planning (FP) is a way of thinking and living adopted voluntarily based on knowledge, attitude, and responsible decisions by individuals and couples. Family planning refers to a conscious effort by partners to limit or space the number of children they have through contraceptive methods [1].

Proper family planning can save lives, yet today more than 200 million women in the developing world don't want to be pregnant but not using modern contraceptive methods, especially long-acting family planning (LAFP) methods such as implants. These family planning methods can dramatically improve the health and well-being of women, families, and communities. Long-acting contraceptive is a human right and is essential to women's empowerment. Also, it reduces poverty, promotes economic growth, raises female productivity, lowers fertility, and improves child survival and maternal health, thus preventing 20-35 % of all maternal deaths by enabling smaller family sizes and balancing natural resource use with the needs of the population [2].

The role of females in family planning has been receiving greater attention recently as population planners have begun to recognize the importance of men's influence over reproductive decisions around the world. Men have a direct and major role in contraceptive decision-making, but also an indirect role as a dominant factor in women's life concerning their own economic, social, and family needs [3]. An uncontrolled population explosion is a burden on the resources of many developing countries. Of the world population, 75% live in developing countries characterized by high fertility rates, high maternal & infant mortality rates, and low life expectancy [4].

It is estimated that up to one-third of maternal deaths can be prevented by using contraception in women who are seeking to postpone or delay post-partum. Across the world, it is estimated that 222 million women have an unmet need for family planning. This unmet need is prevalent populations, especially those who are sexually active, those with low socioeconomic status, those living in rural communities, and those coping with conflicts and disasters [5]. Increasing usage of contraceptives in some developing countries has reduced the annual number of maternal deaths by 40% in the last 20 years and has reduced the maternal mortality rate by 26% in recent years [2].

In Somalia, the reality of reproductive health is far from this goal. Indicators show high maternal and prenatal mortality, high fertility rates, and female genital mutilation [6]. Poor health status of women, sub-optimal nutrition status, and additional hurtful practices further contribute to the high burden of ill health among mothers and newborns [7]. Poor basic education and lack of sexual education in schools, levels of information on risks related to pregnancy and childbirth are low and are more likely to derive from traditional beliefs than from informed health staff [8]. Awareness of the beneficial effects of preventive health services such as vaccination and birth spacing is poor and many misconceptions prevail [9]. Thus, the present study investigated the knowledge, attitude, and practice towards family planning among women of reproductive age in the Bossaso district and suggests possible solutions to increase the utilization of family planning methods.

2. RESEARCH METHODOLOGY

2.1. Study area

This study was conducted in Bossaso city, the third largest city in Somalia and the headquarters city of Bari region, Puntland State (Somalia) between December 2021 and April 2022. Bossaso is located on the southern coast of the Gulf of Aden and the Red Sea. Bossaso is the main commercial city of Puntland and has a major seaport. Historically, Bossaso is known as Bender Qaasim and has an estimated population of about 750,000.

2.2. Study design

A community-based cross-sectional study was conducted among women of reproductive age. Data were collected from the study participants in a face-to-face interview using a structured questionnaire, which was first prepared in English and then translated into Somali language and then back into English. Randomly selected women of reproductive age living in the Bossaso district were our target populations. This research was conducted between December 2021 and April 2022.

2.3. Sample Size

The sample size for this study was calculated using a single population proportion formula, with the assumption of the proportion of family planning among women of reproductive age in Bossaso with a 95% confidence level. The final estimated sample size was 384.

2.4. Data analysis

The data collected was analyzed by using the computer program SPSS.

3. RESULTS

3.1. Socio-demographic and economic characteristics of women of reproductive age

Table 1 summarizes the variables considered in the present study. These variables included the interval age distribution of the study participants, their educational levels, occupations, marital status, incomes, and the number of children per family. The interval age range (21-30 years) was the most frequent (34.9%), and most of the participants (40.9%) had a secondary education level. Further, most respondents were unemployed

(40.1%) and married (44.8%). Most participants had an income/month of fewer than 250 dollars and (4-5) children (Table 1). Upon examination of the know-how, their attitude towards the family planning concept as well as the possible information source on the subject matter, we found that most of the respondents (71.6%) had knowledge of family planning (Fig. 1), and (41.4%) obtained the first information from health centers (Fig.2). Also, most of the respondents (75.8%) knew the benefits of family planning (data not shown). When the participants were asked if family planning may affect their health status, they gave the responses reported in Figure 3. Most of them stated that family planning might affect their health. In addition, most women (62.5%) indicated that their husband approved of family planning (data not shown). Finally, on the question of the nature of family planning that the respondents practiced, most of the participants (44.8%) did not use any form of family planning (Fig. 4). Only 25% of them used contraceptives, the rest (30.2%) applied natural method (Fig.4). Finally, the participants attributed the low frequency of family practice mainly to the cultural barrier (52.2%) but also to husband disapproval and fear of side effects of the contraceptives (Fig.5). It is worthwhile to mention that most of the respondents 71.4%) stated that they did not get family planning assistance from health workers (data not reported).

Table 1. Socio-demographic, economic characteristics, and age distributions of the study participants

Variable	**Percent (%)**
Age in Year	
15-20	18.5
21-30	35.2
30-40	34.9
41-49	11.9
Educational Level	
Illiterate	17.2
Variable	**Percent (%)**
Primary	16.1
Secondary	40.9
University	25.8
Occupation	
Employee	26.3
Self-employee	33.1
Unemployed	40.1
Marital Status	
Married	44.8
Divorced	27.1
Windowed	28.1
Income per month	
<$250	38.3
$250-$500	32.3
>$500	29.4
Number of Children	
0-3	29.4
4-5	42.2
>5 28.4	28.4

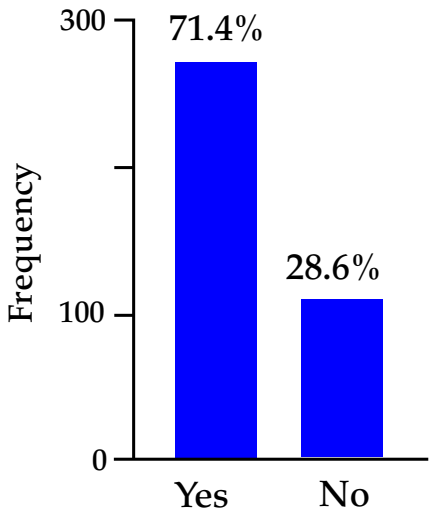

Figure 1. The knowledge of the respondents about family planning

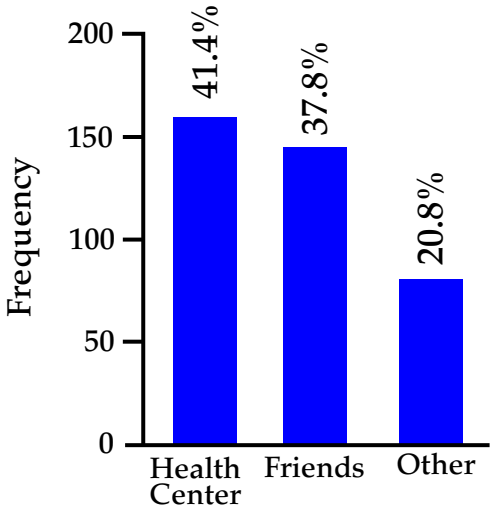

Figure 2. Sources of information about family planning services for the respondents

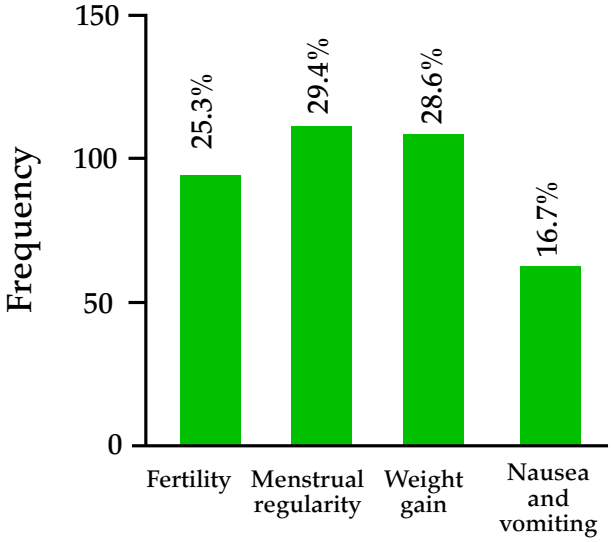

Figure 3. Effects of family planning on their health according to the respondents

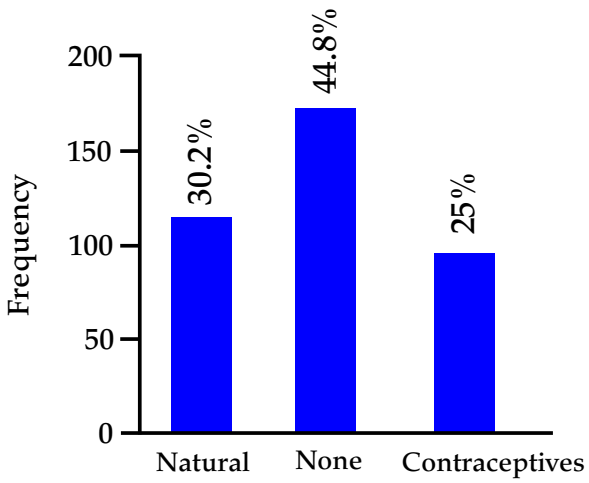

Figure 4. Methods used by the participants for family planning

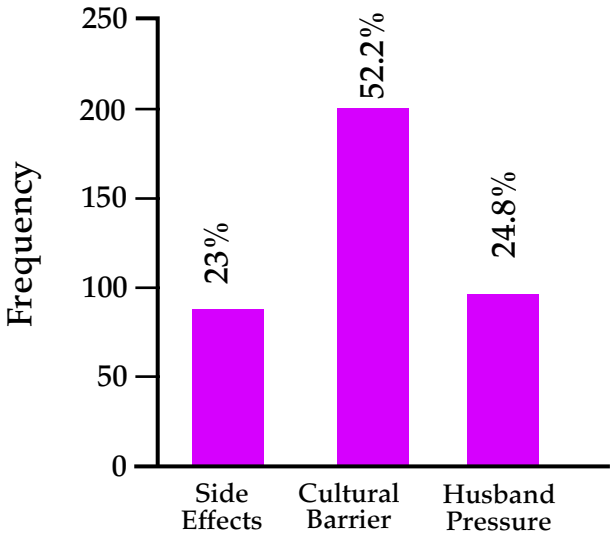

Figure 5. Factors negatively affecting family planning practice

4. DISCUSSION

The objectives of this study were to assess knowledge, attitude, and practice toward family planning among women of reproductive age. Data were collected from the study participants in a face-to-face interview using a structured questionnaire. Our study revealed the socio-demographic and

economic characteristics of women of reproductive age in the Bossaso district. Most participants (35.2%) belonged to the interval age of 21-30 years, whereas 40.9% had completed secondary school education, and 40.1% of the respondents were unemployed. Furthermore, 44.8% of the participants were married, 38.3% had a monthly income of less than $250, and 42.2% had 4-5 children (Table 1).

Further, most respondents (71.4%) knew about family planning, on the contrary, the remaining (28.6%) did not (Fig. 1). Most of the respondents (41.4%) obtained first information about family planning services from health centers, while (37.8%) of them got this information from friends, and the remaining (20.8%) from other sources (Fig. 2). When asked if family planning could affect their health status, 29.4% of the respondents thought it could affect menstrual cycle regularity, while 28.6% of them believed that it could cause weight gain, and others believed that family planning might cause both fertility, nausea, and vomiting (Fig. 3).

In addition, we found that most of the respondents (44.8%) did not practice family planning, and only 25% of them used contraceptives ((Fig. 4). Most of the respondents (62.5%) who used family planning contraceptives did with the approval of their husbands (data not shown). Most of the respondents (52.2%) attributed the low frequency of family planning to cultural barriers (Fig. 5), and 71.4% of the participants stated that lacking family planning assistance from health workers certainly plays a role in reducing the use of family planning method (data not reported).

In conclusion, though most of the participants of the present study knew the importance and benefits of family planning, a significant portion of them (28.6%) had poor knowledge of it. Most respondents thought that the contraceptive might hurt their health status, and culture seems to be a relevant factor impeding the practice of family planning. We recommend raising the awareness of reproductive-age women's knowledge and attitude toward family planning practice.

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ONE-YEAR RETROSPECTIVE STUDY OF GIARDIASIS AMONG PATIENTS WHO ATTENDED BOSSASO GENERAL HOSPITAL (BGH)

Abdinuur Ali, Ruwaida Mohmed

ABSTRACT

Giardia is one of the most common intestinal parasites in the world. It is estimated that there may be as many as 2.5 million cases each year of Giardia intestinalis. Giardiasis is a single-celled protozoan. The parasite also poses a threat in many parts of the world and exists at high prevalent rates, particularly in places with poor water sanitation. Domestically, Giardiasis is often associated with hikers and backpackers getting diarrhea after drinking untreated water in the wilderness. Giardiasis is also very common in daycare settings (it can be passed fecal-orally) and has been found even in municipal water supplies, where the parasite may cause local epidemics.

This study revealed that the prevalence of Giardia lamblia was 53% among patients who attended Bossaso General Hospital in 2021, and there was a difference in the rate of Giardiasis among gender: 62% was male and 38% female. The study also showed that most infected patients (96%) were children under 12 years of age, and a rate of only 4% for the age group above 12 years old.

Keywords:

Giardiasis, Prevalence rate, Bossaso, Children

1. INTRODUCTION

The eukaryotic intestinal parasite *Giardia intestinalis* was first described in 1681 when Antonie van Leeuwenhoek undertook a microscopic examination of his diarrhea stool. Giardia is one of the most common intestinal parasites in the world. There are estimates that there may be as many as 2.5 million cases each year of Giardia intestinalis [1]. Intestinal parasitic infections have a worldwide distribution with high prevalence found in people with low socio-economic status and poor living conditions as well as people in over-crowded areas with poor environmental sanitation, improper garbage disposal, unsafe water supply, and unhygienic personal habits These factors are the causes of a major proportion of the burden of disease and death [2]

Giardiasis is one of the intestinal protozoa that causes public health problems in most developing and some developed countries. *Giardia lamblia* is considered one of the leading causative agents of diarrhea in both children and adults. Many infected persons can be asymptomatic, resulting in difficulties in the eradication and control of this parasite because of the number of potential carriers like adult males (5.3%), school children (39.2%), and food vendors (2%) [3]. This parasite was observed almost three times more in asymptomatic children (9.7%) than in symptomatic children (3.7%) [4]. Epidemiological surveys have shown that parasitic diarrhea in children is primarily due to *Giardia lamblia* infection, particularly in areas where fresh vegetables and drinking water sources are contaminated with sewage stuff, and foodstuffs purchased from street vendors It has been estimated that about 200 million people are infected each year in Africa, Asia, and Latin America [5].

In industrialized countries, the overall prevalence rate of giardiasis is 2-5%). However, in developing countries, Giardia lamblia infects children early in life, so a prevalence rate of 15-20% in children younger than ten years is frequent, the malnourished are more frequently infected [6]. 2.

2. RESEARCH METHOD

2.1. Study Design

A retrospective study design was conducted with a quantitative approach that identifies the year of trend prevalence of G. lamblia by reviewing the laboratory registration book that contains wet mount reports for the detection of G. lamblia parasite among the patients who attended Bossaso

General Hospital, Puntland (Somalia). Five hundred-twenty-nine patients were tested for G. lamblia and used in this study.

2.2. Study Area

The present study was conducted in Bossaso District, the capital of the Bari region. Also, it is the commercial city of the Puntland state (Somalia). Bossaso is in the northeastern part of Somalia and on the southern coast of the Gulf of Aden. Bossaso has a major seaport within the autonomous Puntland State and was previously known as Bender Qaasim. The city has an estimated population of about 750,000.

2.3. Data Analysis

Data collected from the laboratory registration book were analyzed by using the SPSS program.

3. RESULTS

As reported in figure 1, 53% of the total patients (529) were found positive for G. lamblia infection, and 47% were negative. Also, of the patients examined infection rate in males (62%) was higher compared to females (38%) (Fig. 2). Further, there was a significant difference in the proportion of parasiti infection in different age groups.The highest Giardiasis incidence (96%) was found in patients under12 years of age, whereas the Giardiasis rate was only (4%) for patients above 12 years (fig. 3).

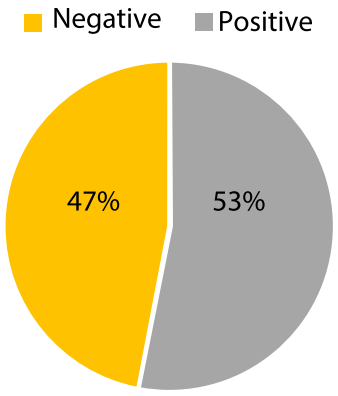

Figure 1. Percentage of patients tested positive for G. Lamblia

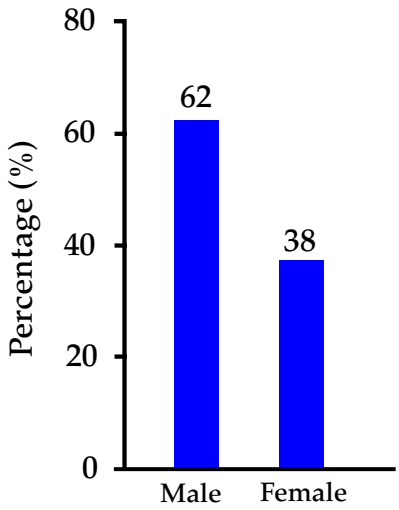

Figure 2, Prevalence of G. lamblia infection on gender basis

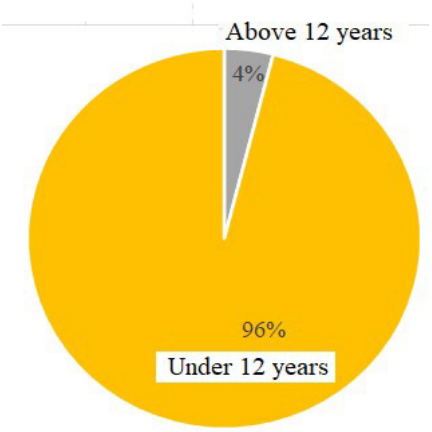

Figure 3. Incidence of G, lamblia infection by agebasis

4. DISCUSSION

The results presented in this study revealed that the prevalence of Giardia lamblia was (53%) among patients who attended Bossaso General Hospital in 2021 and tested for G. lamblia infection. It was found that more males were infected as compared to females (Fig. 2).

Furthermore, the results showed that G. lamblia infection is more frequent (96%) in children under 12years of age (Fig. 3).

This study shows that giardiasis frequency is high in Bossaso and that the most infected are children under 12 years of age. In a previous study on the prevalence of intestinal parasites among Somali refugees conducted in the USA from 1999 to 2016 (n=15,711), 18% were found infected with at least one pathogenic parasite, where Giardia was the most common pathogen (4). Infection rates were highest (25%) among the Somali refugees who arrived from 1999 to 2004 (7).

Thus, giardiasis is still a major health concern in the Somali community and deserves more thorough research on the parasite.

Conclusion

In conclusion, this work showed a widespread incidence of giardiasis infection in the community, and more resources for further investigations of this parasite are warranted.

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APPLICATION OF PESTICIDES TO KHAT CULTIVATIONS RESULTS IN ADVERSE HEALTH RISKS AMONG EXPOSED POPULATIONS AND DETRIMENTAL ENVIRONMENTAL EFFECTS: A COMMENTARY

Abdirahman Abdullahi Warfa

ABSTRACT

Khat (Catha edulis) negatively impacts human health physically and psychologically. But the khat adverse effects on human beings are not limited to its principal constituents. Khat farmers apply pesticides to this plant's cultivations to improve productivity and yield. These pesticides include herbicides, fungicides, insecticides and bactericides. Pesticide residues have been determined in khat leaves, some of which, like DDT, are banned worldwide. Some of these pesticides bioaccumulate in tissues and could cause deadly diseases in men and animals. Here, we briefly comment on the potential effects of pesticide residues in khat leaves on khat chewers and their harmful consequences on the environment.

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Keywords:

Khat; Pesticide residues; Health effects; Environmental damage

1. INTRODUCTION

A pesticide is "any substance or mixtures of substances used to prevent, destroy, repel or reduce any pest."The different substances used as pesticides include chemicals, biological agents, and antimicrobials or disinfectants. Pesticides can be classified according to the nature of their chemical substituents (active groups present in the molecular structure of the pesticide) as herbicides, fungicides, insecticides, and bactericides [1]. A herbicide is used to kill unwanted plants or reduce the growth of weeds. Fungicides inhibit fungi or fungal spores, which may negatively affect the quality and quantity of crop productivity and the profit or yield. An insecticide belongs to a group of pesticides that kills insects in all stages of development, egg, larval and adult. A bactericide is a pesticide used to kill bacteria. This group of pesticides include disinfectants and antibiotics. Since the first synthesis of pesticides, many successes have been achieved in reducing or eliminating harmful vectors of human diseases such as malaria and yellow fever. Also, the use of pesticides led to increased food production in addressing partially feeding the rapidly growing population of the world. Unfortunately, many pesticides negatively affect human health and cause environmental pollution. It is now estimated that 1.8 billion kgs of pesticides are used annually worldwide. Most of these pesticides are used in developing countries, where the know-how of the dangers of these pesticides both to human beings and the environment are not well known, and their management and regulations are not fully applied or, in some areas, are not even considered. Here, I would like to briefly comment on how, generally, the widespread use of pesticides leads to different types of diseases in human beings and, especially, on how pesticide applications on khat cultivations may affect khat cultivators, chewers, combined with negative impacts on the environment.

2. DISCUSSION

2.1. Advantages and adverse effects of pesticides

As mentioned in the introduction, pesticides have lowered many diseases transmitted by insects, fungi and bacteria and raised food production worldwide. However, many pesticides cause diseases in man and animals and significantly pollute the environment. Pesticides are mainly produced by advanced countries, whereas 20% of these pesticides are used in developing countries. It is estimated that there is an increase of circa 5% in pesticide importation annually in third-world countries. What makes the situation worse in third-world countries is that farmers and other people who use pesticides are not trained, and they do not know the dangers implicated in pesticides. Many of

these people are illiterate and cannot read the instructions accompanying the pesticides. It is beyond doubt that pesticides are one of the relevant challenges that developing countries are facing today, and the gist of the matter is that exposure to these pesticides is responsible for some of the deadly diseases of our lifetime (Table 1, see reference 2).

Table 1. Some of the deadly diseases associated with pesticides

Disease	Description
Cancer	Bladder cancer, brain and bone cancers to leukaemia, liver cancers, prostate and pancreatic cancers, lymphoma
Alzheimer's disease	A progressive and fatal disease of the brain
Diabetes	There seems to be some connection between pesticides, like organo phosphates and type 2 diabetes.
Parkinson's disease	A neuro degenerative disease; where nerves are damaged so that they no longer produce dopamine, which helps control muscle movement.
Endocrine disruption	Pesticides disrupt hormone balance, affecting development and reproduction.
Respiratory problems	An increase in asthma has been reported.
Learning and developmental disorders	Some physical and mental disorders of children in the USA have been associated with toxic chemicals.
Reproductive and sexual dysfunction	Exposure to some pesticides affects both female and male reproductive systems, resulting in miscarriage and fetal disorder.

As reported in Table 1, some pesticides might affect the human reproductive system, resulting in miscarriage and fetal disorder. One of the potential consequences of pesticide exposure is a genotoxic effect, which damages the genetic material (DNA). This might lead to foetal disorder (Fig. 1 A and B). It is thought that about a hundred thousand persons die in third-world countries from pesticide exposure consequences, and two million people suffer from the toxic effects of pesticide exposure.

Fig 1. Conjoined Babies at the spinal Cord (A) and at the abdomen (B)

2.2. Pesticide application to Khat farms

Khat (Catha edulis) is an ever-green narcotic, flowering plant most grown in East Africa and Yemen. It is estimated that 5 to 10 million people consume chew khat leaves daily [3-5]. Khat is a valued export commodity in Kenya [6] and Ethiopia [7]. There seems to be a high demand for khat consumption in some parts of East Africa, and, in turn, this has led to increased use of pesticides to enhance khat production [8]. Unfortunately, khat farmers think of only how to increase the productivity of khat cultivations and are unaware of the hazardous effects of pesticides on themselves and family members who are continuously exposed to these toxic products. Some of the farmers keep and store pesticides in their homes. Various pesticides are applied to khat farms, and some of these products are reported in Table 2. These pesticides include fungicides, herbicides and insecticides.

Tables 2. Examples of pesticides

Fungicides	Insecticides	Herbicides
Zineb	Rotenone	Paraquat
Ziram	Pyrethrum	Diquat
Mancozeb	Nicotene	Dioxine
Thiram	DDT	Simazine
Captan	Cypermethrin	Atrazine
Vapam	Fenvalerate	
	Thiodicarb	
	Carbaryl	
	Mathomyl	

Some pesticides are harmful to man and animals and are persistent environmental pollutants. The pesticides sprayed on khat may accumulate in khat leaves and thus endanger the lives of khat chewers. Indeed, the residues of many pesticides were found in khat leaves [8, 9]. The harmful effects of pesticides may spread beyond the farms to distant places via the transportation of khat.

The remains of Khat leaves thrown into the environment further contaminate the soil and water. Surprisingly, some pesticides banned around the globe are still used in some parts of third-world countries. The insecticide DDT is a good example (Table 2). DDT (dichlorodiphenyltrichloroethane) was synthesised in 1874 and used as an insecticide after the second world war against the control of malaria and other diseases. However, chlorinated hydrocarbons such as DDT and derivatives caused adverse environmental pollution (air, soil and water), which led to the inhibition of the use of DDT in 2004 [10]. The chemical structure of DDT is reported in Figure 2. Organochlorines such as DDT are insoluble in water and bioaccumulate in all tissues, particularly in adipose tissues with longer half-lives [11].

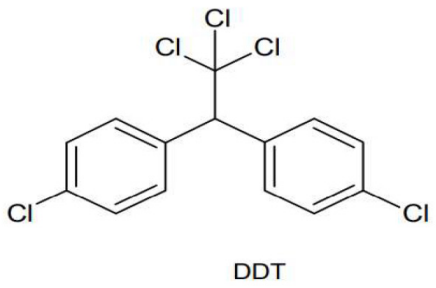

Fig. 2. The chemical structure of DDT

The continuous use of even forbidden pesticides by farmers in some parts of the world indicates the weakness of the institutions involved in safeguarding the welfare of their people. Unfortunately, the International UN organisations like WHO, FAO and UNICEF, too, have not taken decisive steps in addressing these issues but are limited to reports and literature documentation.

More tangible practical steps are needed to raise the awareness of the farmers and those occupationally involved in pesticide practices. Today, the world is one village, and what happens in any part of the world affects each of us. Somalia is one of the developing countries where the importation of pesticides occurred and, after the civil war, pesticides, previously under the authority's control, fell into the hands of ordinary people with no knowledge of the dangers of pesticides. Now no regulatory organs exist to exercise control over pesticide or drug regulations. The business of these products is still in the hands of private businessmen with no control over them.

Though khat farms are very limited in Somalia, this stimulant is exported to us from the neighbouring countries, Kenya and Ethiopia. The adverse effects of pesticide residues in khat affect the consumers (khat chewers) and the environment. The Somali khat consumers have no clue of how the khat that they daily consume is cultivated, nor are they aware of the nature of the pesticides applied to these farms, let alone the harms that both the drug and the chemical residues sprayed the farms might provoke in their health and their environments. As discussed above, pesticide residues bioaccumulate in tissues with risks to their health and the environment. There is a wealth of scientific literature published on the deadly effects of pesticides, and we urge the Somali people that the consequences of pesticide residues in khat leaves might be observed not immediately but at a later time, or even in the children. Some people think that by washing the vegetables or khat leaves, one might get rid of the chemicals sprayed on them. That is not true. The pesticide residues penetrate the tissues of the vegetables and khat leaves, and some of these products are converted into more dangerous substances by the plant tissues. In conclusion, in Somalia, Khat cultivation is confined and not widespread. Khat is imported from neighbouring countries and has various deleterious effects on our society: health-wise, economic and social ramifications.

What is not known to most ordinary people is that pesticides are sprayed on khat leaves and might contain toxic chemicals and pesticide residues, which could endanger the lives of Khat chewers, their families and the environment. It is our collective responsibility to raise the awareness of our people towards the hazardous consequences of khat consumption on their health and the environment.

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THE ACTIVE PRINCIPLE PRESENT IN KHAT AND ITS MECHANISM OF ACTION

Ahmed M. Osman

ABSTRACT

Khat (Catha edulis) is an evergreen shrub that grows at high altitudes in areas extending from eastern to southern Africa and in Arabian Peninsula. Chewing Khat has both physical and psychological adverse effects. The most evident effects after khat consumption are CNS stimulation and sympathomimetic effects. The primary active principle in Khat that explains the observed effects in humans and experimental animals was identified as cathinone, an alkaloid that is an amphetamine-like product. Cathinone, like amphetamine, seems to mediate the release of neurotransmitters at the catecholaminergic synapses, particularly at dopaminergic and serotoninergic synapses, increasing the levels of these neurotransmitters in the brain. Here, we summarize an updated, presently held view of the mode of action of cathinone, which was shown to account for the observed khat effects in man.

Keywords:

Khat; Active Principle of khat, Mechanism of action, Health effects

1. INTRODUCTION

It is thought that khat originated in Ethiopia but now grows in Kenya, Somalia, Uganda, Tanzania, The Congo, Zimbabwe, Yemen, Afghanistan, and Madagascar [1]. The use of khat goes back centuries and one of the earliest records is a book entitled Kitab Al Akra-bazin" or "Book of compound drugs" authored by someone named Najeeb Ad Din of Samarkand, who died in 1220 AD ([2] and the references therein). This author stated that khat was for the relief of melancholy and depressive symptoms [2]. Most researchers think that khat reached Somalia from Harar and from there spread to the north-western of Somalia [2]. Because of the lack of transport means combined with the perishability of the leaves of the plant, the spreading of khat to the rest of Somalia took a long time, and only in the early 20th century cases of khat use was reported in Hargeisa [2]. Though khat spread slowly in the northern regions of Somalia, initially, its spread was slower in the southern part as people opposed the introduction of khat into their areas. However, after the independence of Somalia and the unification of northern and southern regions in July 1960, khat reached parts of the south [2]. In 1983, khat consumption in the country increased so greatly that its adverse effects on social, economic, administrative, and health deeply affected the citizen. Consequently, the then Somali Government prohibited khat cultivation, consumption, and marketing in the Somali territory, and a National Committee for Khat Eradication was established [2, 3].

Following the civil war and the Somali state collapse in the 1990s, things got out of hand, and khat spread throughout the country, aggravating the social tissue, economic, and health issues already negatively devastated by the civil war. This brief note aims to summarize an updated current knowledge on the mechanism of action of the principal constituents of the khat plant, which account for the observed effects in human beings.

2. DISCUSSION

2.1.Khat effects on man

Within one hour of Khat consumption, chewers report a sensation of happiness, well-being, euphoria, alertness, increased self-esteem, capacity to associate ideas, and increased imaginative ability, followed by undesirable effects [4]. These negative experiences include over-talkativeness, anxiety, irritability, wakefulness, and, in some cases, psychotic illness and depression [4]. However, prolonged use of khat usually leads to serious effects on the central nervous system and circulatory systems and causes gastrointestinal problems and psychological damage [1, 4]. The adverse effects of khat on body systems have been studied and described, as summarized in Table 1.

Table 1. Adverse health effects observed in khat abuse (see [4] and the references therein)

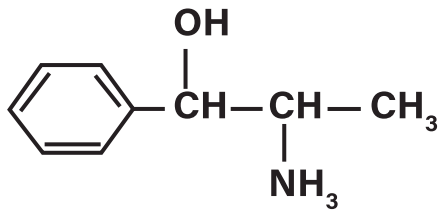
Body system affected	Effects of khat observed in mankind
Nervous system	Euphoria, exhilaration, insomnia, talkativeness, fatigue, depression, headache/migraine, tremor, psychotic events, hallucination, inability to concentrate, irritability, cognitive impairment and decreased short memory
Respiratory	Tachypnoea, pulmonary edema, bronchitis
Gastrointestinal tract	Constipation, polydipsia, gastritis, oesophagitis, stomatitis, stomach and duodenal ulcers, appetite suppressing effects and increased risk of upper gastrointestinal tumor
Hepatic system	Cirrhosis, fibrose, acute or chronic liver failure
Urogenital	Impotence, libido change, spermatorrhea, fetal or neonatal toxicity, urinary retention, kidney damage
Metabolic and endocrine system	Hyperthermia, perspiration, change of glucose level, multiple hormonal disorder
Circulatory system	Tachycardia, vasoconstriction, increased heart rate and blood pressure, myocardial infarction, and arrythmia

Khat increases heart rate, blood pressure, palpitation, and tachycardia and enhances the probability of myocardial infarction as well as arrythmia (Table 1). In the gastrointestinal tract, khat causes constipation, polydipsia, gastritis, stomach, and duodenal ulcers, stomatitis, oesophagitis, and suppresses appetite, etc. (Table 1). The liver might be affected, resulting in cirrhosis, fibrosis, and chronic liver failure. Also, khat affects the respiratory system causing tachypnoea, pulmonary edema, and bronchitis. Further, khat affects the genitourinary system and might cause libido change, impotence, fetal or neonatal toxicity, and renal damage. Other systems that khat could affect include the metabolic and endocrine systems causing hormonal disorders, disturbance in the blood glucose level, and hyperthermia. One of the most affected systems is the nervous system, where khat causes euphoria, insomnia, headache, migraine, inability to concentrate, fatigue, cognitive impairment, and loss of shortterm memory, etc. (Table 1).

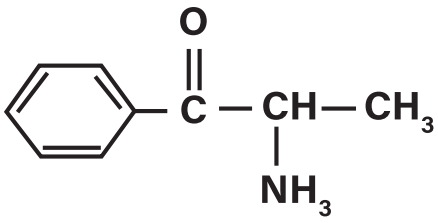
In addition to these health effects, khat has other harmful effects such as social problems, economic problems, administrative problems, and even insecurity. The basic unit of society is the family. Khat disintegrates the unity of the family as it leads to a lack of care and negligence since the khat chewer concentrates on finding money for khat consumption instead of thinking about the well-being of the family [2]. The khat chewer might even sacrifice his vital needs for a portion of khat [2]. Add to that the illicit behaviours that khat and the environments of its consumption create in society. Most khat retailers throughout Somalia are women. There is no doubt that khat has harmful effects on the economy of poor developing countries. In 1983, the then Ministry of Finance estimated that about 5.7% of the GDP of Somalia ($57.000.000 was spent on khat importation [2]. Because of the diffusion of khat to every corner of Somalia, the cost of khat importation to Somalia is much more than the cost three decades ago. The annual cost of khat imported from Ethiopia to only the north regions (Somaliland) is estimated to be around $ 50 million US dollars [6]. When khat importation from Kenya was prohibited by President Mohamed Abdullahi's "Farmajo" administration, it was estimated that Kenya lost $110 million in 2021 [5]. With our meager economy and productivity, such an expense for a harmful drug is unacceptable. Also, khat consumption encourages corruption and maladministration and weakens state institutions [2,6]. I argue that khat even contributes to the insecurity of our country. If the soldier responsible for the security of the land and the citizen is engaged in chewing khat, while the soldier is working at a critical checkpoint, what kind of security would you expect?

2.2.The Active Principle of Khat

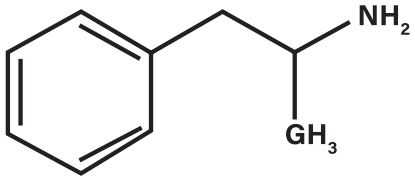
In 1930, Wolfes [7] first attempted to identify the active ingredient present in khat. He found an alkaloid compound, nor-pseudoephedrine (cathine), in khat leaves, and until 1960 scientists thought this compound was the active principle in khat. But the potency of this cathine on CNS stimulation was lower than that observed in khat leaves. Thus, the search for the active principle continued until 1975 when The United Nations Narcotics Laboratory identified a ketone of cathine named cathinone from freshly freeze-dried khat leaves [8]. The chemical structures of cathine and cathinone are reported in Figure 1. Cathinone is the principal psychoactive constituent of khat. Cathinone was found to be labile and unstable and decomposed to cathine [9]. This explains why fresh khat leaves have more effect than dried ones and why khat users prefer fresh leaves. The conversion of cathinone to cathine begins after khat harvesting, and therefore leaves are kept in a cool place and wrapped in banana leaves.



Nor-isopseudoephedrine (cathine)



Cathinone



Amphetamine

Figure 1. The chemical structures of cathine, cathinone, and amphetamine

The cathinone content in leaves from different countries varies from 0.9-3.3%, with the highest content found in

khat of Kenyan origin [10]. The molecular structure of cathinone is like amphetamine, a wellknown CNS stimulant ((Fig. 1). Fresh leaves of khat contain other chemicals, including other alkaloids, terpenoids, glycosides, tannins, some vitamins, and minerals such copper, zinc, manganese and other toxic metals like cadmium and lead [4].

2.3. Mechanism of action of cathinone

The chemical structure of cathinone is like that of amphetamine (Fig. 1), and khat has amphetaminelike stimulating effects on the central nervous system. Thus, cathinone has comparable pharmacological and sympathomimetic effects to amphetamine in both humans and experimental animals. Amphetamine derivatives are structurally like neurotransmitters known as catecholamines, namely adrenaline, noradrenaline, and dopamine (see figure 2).

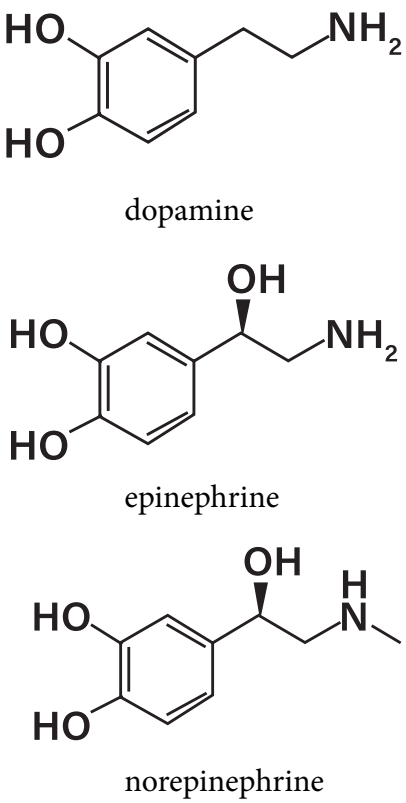


Figure 2. The chemical structures of catecholamines

The effects of amphetamine are mediated by the release of these neurotransmitters, particularly at the catecholaminergic and serotonergic synapses (see figure 3). The neurotransmitters are released in the brain and the peripheral nervous system. The increase of the neurotransmitter in the synaptic cleft (the space between the presynaptic neuron and the postsynaptic neuron) triggers the amphetamine-observed effects in the CNS. Cathinone has been shown to act like amphetamine, releasing the catecholamines from the vesicles in the presynaptic neuron (e.g., dopamine, see figure 4), blocking the reuptake of dopamine and inhibiting the enzyme monoamine oxidase (MAO) located in the mitochondrion, which degrades the neurotransmitter. Both the reuptake of the neurotransmitter and its degradation by MAO lead to the inactivation of the neurotransmitter. The increase of neurotransmitters (e.g., dopamine) explains the observed khat effects on man. Figure 4 summarizes the mechanism for khat effects mediated by cathinone and its degradation products, cathine, and its isomer.

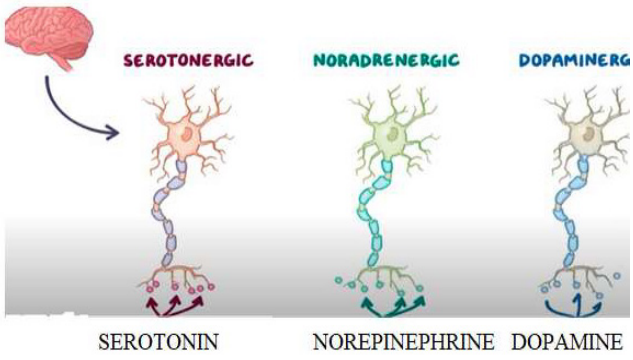


Figure 3. Both amphetamine and cathinone mediate the release of neurotransmitters

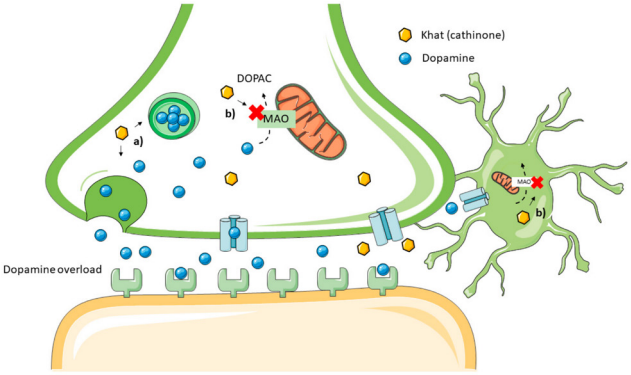


Figure 4. Mode of action of cathinone at the central nervous system.

Cathinone releases dopamine from the vesicles and inhibits the mono amino oxidase enzyme (see [4] and the references therein).

Conclusion

In conclusion, khat is a herbal drug abused by over twenty million, especially in East Africa and the Arabian Peninsula. The main psychoactive constituent of khat is cathinone, β-keto alkylamine. This product undergoes reduction to cathine and nor-ephedrine, which are less potent than cathinone. Chronic khat consumption leads to serious health problems in the central nervous, cardiovascular, respiratory, urogenital, and gastrointestinal systems. An increase in heart rate, blood pressure, and arrythmia was observed. Cases of liver and mouth cancer have been reported, and esophagitis and stomatitis are usually diagnosed in khat abusers. The astringency of tannins present in khat might explain the observed oral effects. In addition to these adverse health conditions, khat causes social, economic, administrative, and security problems, especially in developing war-torn countries like Somalia. To encourage khat importation to our country is a big mistake. On the contrary, we need to address the problems leading to khat consumption, such as unemployment of our youth and women, lack of care and free education opportunities for the poor. Khat has no positive effects but negative ones and endangers our identity and values, and we should raise the awareness of our people against the harmful effects of khat.

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INVESTIGATIONS OF THE SOURCES, PREPARATION, CONSERVATION, AND ATTITUDE OF CONSUMERS OF VEGETABLES IN BOSSASO CITY

Fadumo Mohamud Abdirahman and Ahmed M. Osman

ABSTRACT

This study investigated the sources of vegetables sold in Bossaso city, the stable vegetables, the scarce ones, and the ways of washing, preparation and conservation methods used by the local vegetable sellers. Also, the study assessed the knowledge and attitude of consumers in Bossaso city regarding the role of vegetables in their health. Emphasis was put on two groups of people. One group represented the sellers and consisted of twenty individuals. The second group represented the consumers and consisted of forty individuals. Among the variables considered were the age and gender distributions of the consumers. The age interval (31-35 years) was the highest in frequency (about 33%), and most were females (55%). Educationally, the frequency of those with diplomas and the illiterates was the same (each 28%). Most vegetables originated from Ethiopia (30%), whereas Puntland produced 20% only of the vegetables. The most used vegetables in Bossaso are roots and tubers such as carrots, onions, and garlic. Some vegetables are rare, and their scarcity could be caused by poor local agricultural production (35%) but also by droughts and a lack of security. Most of the respondents (60%) believed that vegetables are relevant to their health, whereas 40% of them did not agree with that. Another variable considered was the frequency of vegetable consumption per week. Most consumers (30%) eat vegetables three times per week. Also, most consumers (45%) eat cooked vegetables instead of raw ones. Finally, we report here the methods of vegetable conservation used by the sellers and the duration of their stability for several vegetables. In sum, the study revealed the main sources of vegetables in Bossaso, the ways of their conservation, the frequency of their consumption, the knowledge, and the attitude of consumers towards
vegetables.

Keywords:

Vegetables; Consumers; Knowledge; Sources; Attitude; Bossaso city

1. INTRODUCTION

Vegetables are important components of a healthy diet due to their richness in vitamins, minerals, phytochemicals, and fibre content. Reduced consumption of vegetables and fruits is associated with poor health and an increased risk of non-communicable diseases, such as cardiovascular diseases and certain types of cancer (1-3). Vegetables are annual or perennial horticultural plants with certain sections (roots, stalks, flowers, fruits, leaves, etc.), which can be consumed wholly, partially cooked, or even raw (4).

The essential vitamins found in vegetables include vitamins C, and A, which are known to be important for health. Vitamin C is an antioxidant that scavenges reactive oxygen species and is vital for connective tissues and iron absorption. On the other hand, vitamin A is critical for vision and has a role as an antioxidant. In addition to these vitamins, vegetables are a rich source of minerals that are important for the proper functioning of the body and contain bioactive compounds such as carotenoids and flavonoids that are essential for our health and well-being. Some of these compounds have anti-carcinogenic properties, whereas others reduce the risk of coronary diseases (1-3). Further, the fibre content of vegetables lowers the risk of diabetes, certain cancers, and obesity (5,6). It is not surprising, therefore, that millions die worldwide every year because of inadequate consumption of fruits and vegetables.

The present study aims to understand the sources of vegetables in Bossaso city, the knowledge, attitude, and practice of consumers towards vegetables, as well as to investigate the methods of preparation and conservation used by the local sellers.

2. RESEARCH METHODOLOGY

2.1. Study area

This study was carried out in Bossaso, the Bari region's headquarters, and Puntland's main business center. It has one of the principal seaports in Somalia. The city is situated on the southern coast of the Gulf of Aden and the Red Sea.

2.2. Study design

This research aimed to collect information on the vegetables sold in the market of Bossaso city and to understand the knowledge and attitudes of consumers towards the vegetables. Data were collected from two target groups, selected randomly, namely, twenty sellers and forty consumers. We applied interview and questionnaire methods for collecting data on the target groups. We did not consider strict vegetarians because their number is insignificant in our society.

2.3. Data analysis

Data analysis was performed by using the computer SPSS.

3. RESULTS

Background information of the respondents

Most respondents (about 33%) belonged to the interval age group (31-35 years), whereas those above 40 years had a frequency of 13%. Females were more frequent (55%). Regarding the education of the respondents, most of them were either illiterate or had a diploma with equal frequency (ca. 28%). Upon inquiry about their occupations, the dominant group (about 33%) was vegetable sellers; but some of them were students (20%), others were housewives (10%), some were unemployed (16.7 %), and those with other occupations (20%).

Further, forty-five percent of them had (5-10 years) of experience in the vegetable field, 25% of them had (11-25 years), others (10%) had above 20 years, and 20% of the respondents had less than five years of experience in the vegetable field. Next, we investigated the most common types of vegetables brought to the Bossaso market, their sources, the rare ones, and the possible factors leading to the rarity of the latter group.

Types of vegetables, their sources, and the rare ones sold in the Bossaso market

Figure 1 reports the most common vegetable types sold at Bossaso market, including leaf, stalk, root and flower, tuber, and legumes. Of these, the root and bulb vegetables (i.e., carrot, garlic, onion, radish, ginger, etc.) represent the most frequent group (Fig. 1).

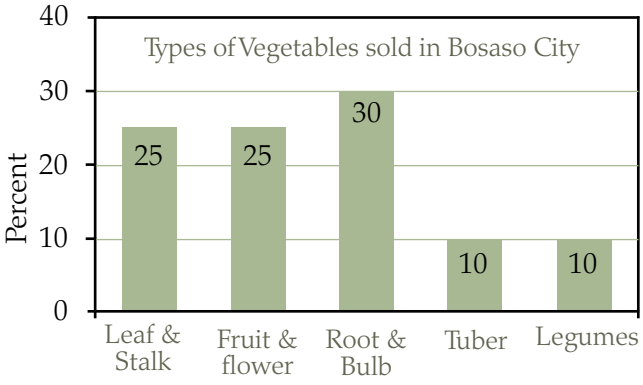

Figure 1. Types of vegetables sold at Bossaso market

As shown in figure 2, the vegetables consumed in Bossaso come from various sources, namely, from Puntland, other areas of the country, and some of our neighbours, Ethiopia, and Yemen. Thirty percent of the vegetables sold at Bossaso market originate from Ethiopia (Fig. 2).

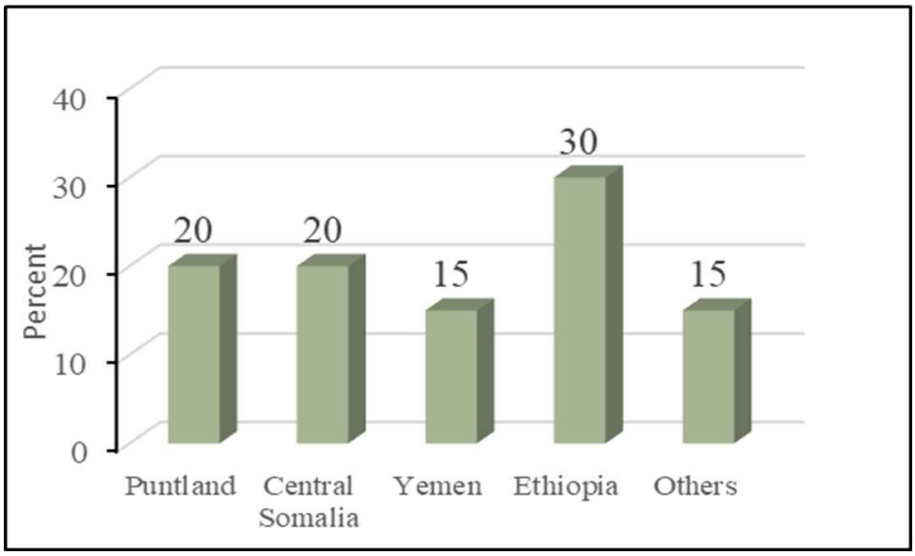

Figure 2. Sources of vegetables sold at Bossaso market

Only 20% of the vegetables originate from Puntland. Some vegetables are rare to find in the Bossaso market (Fig. 3). Most of the sellers attributed the scarceness of the latter vegetables to poor, local agricultural production (35%); other reasons that the sellers ascribed to this scarcity included seasonal changes (20%), droughts and floods (15%), insecurity (10%) and other motives (15%).

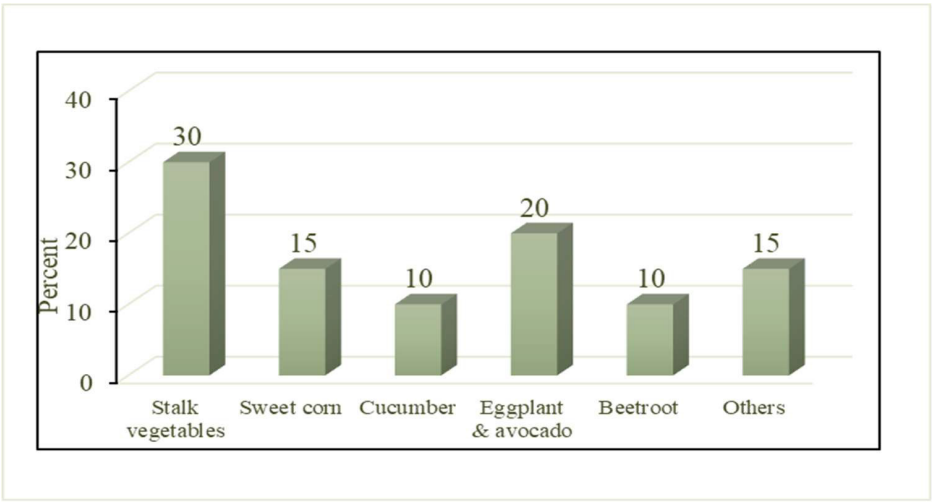

Figure 3. The rare vegetables sold at Bossaso market

In addition, we investigated the knowledge and attitudes of the respondents toward vegetables.

The knowledge of the consumers about the roles of vegetables in health

To the question: are vegetables important for your health? Sixty percent of the respondents answered positively, and the rest (40%) found vegetables irrelevant. Those who thought that vegetables are essential for health stated that vegetables are rich in vitamins, stimulate digestion, prevent constipation, and reduce

chronic diseases. In contrast, the consumers who negated the role of vegetables in health justified their use of vegetables for cultural purposes, for dressing meat, and some said they consume vegetables only for filling up their stomachs (data not shown).On the question: of whether the consumers had ever been informed about the role of vegetables in health, and if the answer is affirmative to name the sources of the information, the majority of the consumers (67.5%) had prior knowledge, and the rest did not. The main sources were radio, tv, and other social media. Furthermore, we probed the ways consumers clean, prepare, how often they consume, and conserve vegetables.

Preparation, methods of conservation, and frequency of consumption of vegetables

Most of the consumers wash the vegetables three times with only water (36.4%), whereas about 22% wash the vegetables once with either hot water or with only water (21.8%) or other ways (20%). About 45% consume cooked vegetables, 24% eat raw vegetables, and the rest (31%) consume both cooked and raw vegetables. Further, most of the consumers (35.7%) cook vegetables with oil, others with oil and water (28.6%), with water only (9.5%), and with other means (26.2%). As to the frequency of consumption of vegetables, most respondents (35%) consume vegetables three times per week, 30% less than three times per week, 23.3% six times per week, and 11.7% more than six times per week. Finally, the different methods of vegetable conservation that sellers employ, and the duration of days are summarized in Table 1.

Table 1. The different methods of vegetable conservation and the duration of days for various types of vegetables as indicated by the vegetable sellers

Types of vegetables	Method of Conservation	Duration (days)
Tomato	Open-air at room temperature	7
	In a basket	8-9
	In wet tissue at room temperature	10-12
	Refrigerator	>12
Potato,Eggplant, Squash,Cucumber, Cabbage, and Beetroot.	Open-air at room temperature.	9
	Away from moisture and humidity.	10 -15
	Away from overcrowding.	>15
Onion, Garlic, and Carrot.	Open-air at room temperature.	10 -15
	Basket.	16 -18
	Away from moisture and humidity.	18 -22
	Away from overcrowding.	>22
Spinach, Coriander, Lettuce, Chili, and Okra.	Sprinkle their surface with water.	1 - 2
	Open-air at room temperature.	2 - 4
	In wet tissue without overcrowding.	4 - 6
	Refrigerator without overcrowding	7-10

4. DISCUSSION

An adequate intake of fruits and vegetables forms a relevant part of a healthy diet. Consumption of diets low in fruits and vegetables constitutes a risk factor for several chronic diseases, such as coronary heart disease, stroke, cancer, cataract formation, etc. (7). The present study investigated the sources of the vegetables sold at the Bossaso market, the most common vegetables used by the consumers, the rare vegetables in the city, the factors responsible for their scarcity, the ways of washing, preparing, and cooking of vegetables, the know-how of the consumers of the role of vegetables in health and the methods of conservation of vegetables used by the sellers. To achieve these goals, two groups were selected: one group represented the sellers and consisted of twenty individuals, and the other category of forty individuals represented the consumers. The variables such as age distribution, gender, educational level, and work experience were studied. The most frequent (33%) age interval was (31-35 years), and 55% were females. Most were illiterate or had a diploma with equal frequency (ca. 28% each).

The findings revealed that most of the vegetables consumed in Bossaso originate from Ethiopia (30%). Puntland contributes only 20% of the vegetables. Other vegetables come from central Somalia and Yemen (Fig.1). The most common vegetables consumed in Bossaso are roots and bulbs such as carrots, onions, and garlic (Fig. 2). Some are scarce (Fig. 3), and the reasons for their rarity are, in the opinion of the sellers, caused by poor agricultural production of these vegetables in our country. Also, other reasons, such as droughts, low rainfall, and insecurity, were pointed out. Another important objective was to understand the attitude of consumers toward vegetables. We found that 60% of the consumers retain that vegetables are relevant for their health, and 40% do not. The first group provided reasons for this positive role of vegetables in health: the stimulation of digestion, protection against chronic diseases, prevention of constipation, and the richness of vegetables in micronutrients, namely, vitamins and minerals. The second group stated that they consume vegetables only for cultural purposes, dressing meat, and filling up their stomachs (data not shown). Furthermore, an important issue is the frequency of consumption of vegetables per day. Most of them (30%) consumed vegetables only three times per week instead of the recommended 3-5 times servings per day (8). Many consumers eat cooked instead of raw vegetables. This is not positive for some vegetables because vitamins, such as folic acid and antioxidants, may be destroyed during the cooking process (9). Finally, the conservation methods used by the sellers and the duration stability in days for various vegetable types are reported in Table 1. The method of choice depends on the vegetable type, but a low temperature, avoiding overcrowding, and moisture are favourable conditions for vegetabl conservation.

Conclusion

In conclusion, this study revealed the principal sources of origin of the vegetables consumed in Bossaso, the most stable in the market, the rare ones, and the methods of washing, preparation, cooking, and conservation of the vegetables by the consumers. Also, we found that consumption frequency was far below the recommended levels.

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PREVALENCE AND ASSOCIATED FACTORS OF OCCUPATIONAL HEALTH HAZARDS AMONG MUNICIPAL SOLID WASTE COLLECTORS OF KHARTOUM LOCALITY, KHARTOUM STATE SUDAN 2021

Ibrahim Mohamed Jama

ABSTRACT

Municipal solid waste collection is one of the most dangerous jobs worldwide. Waste workers have important occupational health issues associated with it. In Khartoum, waste collectors' related occupational morbidities are not addressed. The present study aimed to determine occupational health hazards' prevalence and their associated factors in Khartoum's locality (Sudan). A cross-sectional study was conducted among municipal solid waste collectors from February to July 2021. Khartoum's locality is divided into nine different sectors with a population of 682,442 each. The total number of waste collectors was 1013. A multistage sampling technique was used with a sample size of 726. A total of 568 waste collectors (response rate 78%) participated in the study, among whom the prevalence of occupational health hazards was 88.7%; we found six types of occupational health hazards. Gastrointestinal effect (GIT) was the most frequent type (85%), and cardio-pulmonary problems (CPS) were the least (47%). Missing days' work, lack of training related to the occupation and awareness of personal protective equipment (PPE) were significantly associated with occupational health hazards.

Keywords:

Municipal solid waste collectors, Personal protective equipment, Occupational health hazards and awareness

1. INTRODUCTION

Municipal solid waste handling and disposal is a growing environmental and public health concern. The collection of household waste is a difficult job which involves working on a vehicle that moves through traffic throughout the year. It also requires repeated heavy physical activities, such as manual lifting and handling heavy bins [1].

Waste collectors are exposed to several pathogens (i.e., bacteria, fungi, viruses, parasites and cysts), toxic substances and chemicals from the waste, and from its decomposition, as well as vehicle exhaust fumes, noise, extreme temperature and ultraviolet radiation. As a result of their exposure to multiple risk factors, municipal solid waste collecting workers suffer from high rates of occupational health problems [1].

In developing countries, municipal solid waste management-related occupational morbidities are not addressed. The collection, transfer, treatment, recycling, recovery, and disposal of solid waste in urban areas is called municipal solid waste management (MSWM) [2]. Globally, municipal solid waste work has multiple health effects because of the need to lift, carry, pull, and push included in the loading/unloading processes. The waste collection area is comfortable for insects, rodents, and scavenging animals, which have the potential for the breeding of disease-causative agent carriers [2].

Around the world, solid waste has been collected using plastic/paper bags, bins/drums twowheeled and four-wheeled containers. In Iran, the relevant portion of solid waste is collected in plastic bags door-to-door, and the rest is collected using two/four-wheeled containers [3]. Sub-Saharan African countries appear to have the highest rate of occupational injuries, followed by Asia [4].

The present study aims to determine the prevalence of occupational health hazards and the associated factors in Khartoum's locality (Sudan).

2. RESEARCH METHODOLOGY

2.1. Study Design

A cross-sectional study design was used to determine the prevalence of occupational injuries and their associated factors among solid waste collectors in the Khartoum locality in 2021.

2.2. Study Area

Khartoum is the capital city of Sudan, which is divided into Omdurman, Bahri and Khartoum by the White and Blue Nile rivers. Khartoum state consists of seven localities. Khartoum locality cleaning corporation (KLCC), which has nine different sectors, is responsible for waste collection in this locality. A total of 1013 solid waste collectors work in Khartoum locality cleaning Corporation. The source population were municipal solid waste collectors who worked in the Khartoum locality in 2021.

2.3. Sampling Technique and Sample Size

First, all nine sectors of the Khartoum locality cleaning corporation were included in the study. Second, a stratified random sampling technique was used to distribute the wastecollecting workers proportionally to the size of each sector. Third, simple random sampling was used to randomly select waste workers who had been interviewed per sector unit.The sample size was estimated by using Slovin's formula which is n=(N/1+Ne2), where: n=sample size, N=population size and E=margin of error =5%

2.4. Data Collection and Statistical Analysis

Data were collected using a structured interviewer-administered questionnaire. The questionnaire was prepared in English and translated into Arabic, and then the answers were translated back into English to check the consistency. The questionnaire was pretested on 20 participants (16 MSW workers and four waste pickers) who fulfilled the inclusion criteria. Data were organised and entered into Epi info, then exported to Excel Microsoft and, finally, exported to SPSS version 23 and analysed.

3. RESULTS

3.1. Population, sample sizes and characteristics of the study participants

Table 1 reports the population of waste collection workers of all nine sectors of the Khartoum locality cleaning corporation with their determined proportional sample sizes that participated in the present study. The sample size of each sector was determined using Slovin's formula at the confidence level of 95%.

Table 1. The population of waste collectors and estimated

Sector	N	n	$1+Ne^2$	Ne^2	e^2
Shajara	77	65	1.1925	0.1925	0.0025
Khartoum Shimal	271	162	1.6775	0.6775	0.0025
Sahafa Jabra	156	112	1.39	0.39	0.0025
Tuti	18	17	1.045	0.045	0.0025
Burri	91	74	1.2275	0.2275	0.0025
Sahafa Markaz	159	114	1.3975	0.3975	0.0025
Khartoum El Shergi	166	117	1.415	0.415	0.0025
Gherb	69	59	1.1725	0.1725	0.0025
Kinsi Turbi	6	6	1.015	0.015	0.0025
Total	**1013**	**726**			

Further, as reported in Table 2, of the 568 participants, males were predominant (99.3%). Their ages ranged from 16-79 years, with a median age of 42. 42.5% of them were married, and 38.6% were single. The rest were divorced and widowed. More than half of the participants (63.6%) attended Khalwa, and 99.3% were temporary workers. Most of them (97.9%) had no health insurance card. Hence, only 2.1% benefited from medical check-ups.

Table 2. Characteristics of the study participants (n=568)

Variable	Number	%	Variable	Number	%
Gender			**The locality of residence**		
Male	564	99.3	Jabal awliya	463	81.5
Female	4	0.7	Khartoum	78	13.7
Age in years			Sharqi anni	16	2.8
Median	42		Khartoum North	10	1.8
Min - Max	16 - 79		Omdurma	1	0.2
16 - 24 years	20	3.5	**Holding a health insurance card**		
25 - 42 years	280	49.3	No	556	97.9
More than 42 years	268	47.2	Yes	12	2.1
Marital Status			**Benefited from medical checkup**		
Married	242	42.5	No	453	79.8
Single	219	38.6	Yes	115	20.2
Divorce	102	18.0	**Know medical checkup**		
Widow	5	0.9	No	196	34.5
Education level			Yes	372	65.5
Khalwa	361	63.6	Had medical checkup		
Primary	180	31.7	No	428	75.4
Secondary	18	3.2	Yes	140	24.6
University	4	0.7			
None	5	0.8			
Employment Status					
Temporary	564	99.3			
Permanent	4	0.7			

Table 3. Work experience and duration in years, days and hours (n=568).

Variable	Answer	%
How long are you doing this work in years?		
Mediar	5	
Min – Max (years)	1-22	
1-5 years	317	55.8
> 5 years	251	44.2
Working days per week		
Mediar	6	
Min - Max	4 - 7	
1-4 Days	3	0.5
5 Days	65	11.4
> 5 Days	500	88.1
Working hours per day		
Mediar	9.0	
Min - Max	4.0 - 12.0	
1-7 hours	69	12.1
8 hours	191	33.6
> 8 hours	308	54.3

3.2. Prevalence of occupational health hazards and their types as reported by waste collectors

As shown in Figure 1, most waste collectors (88.7%) reported health problems, whereas only 11.3% did not. Six types of occupational health hazards challenged the waste collectors in Khartoum) locality (Fig. 2). The most frequent health hazard reported was gastrointestinal (GIT) problems (85.0%), and the least frequent were cardio-pulmonary problems (47.0%).

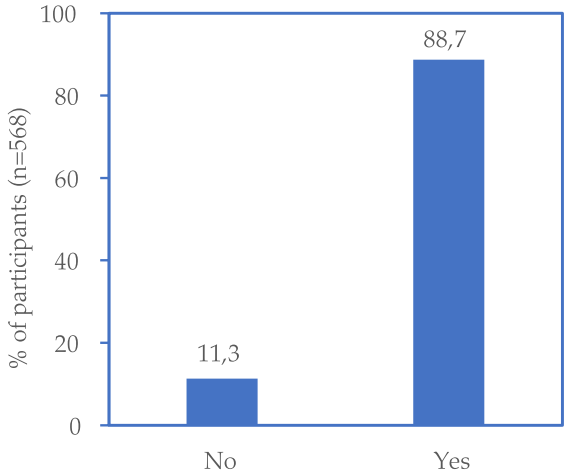

Fig. 1. Prevalence of occupational health hazards as reported by the waste collectors

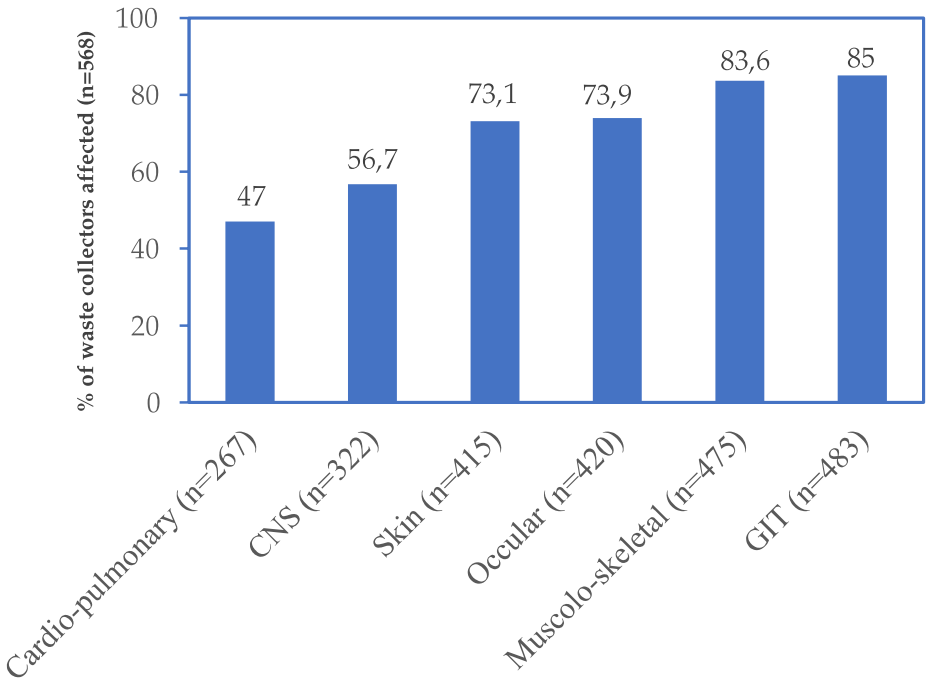

Fig. 2. Types of health hazards reported by the waste collectors (n=568)

Five of the reported type health hazards were statistically associated ($p < 0.05$) with the age of the participants. In contrast, no statistically significant association (p=0.18) was found between the age of the waste collectors and skin problems, indicating that skin problems affected all ages (Table 4).

Table 4. Association between the ages of the participants and occupational health hazards

	Health hazard				
Age in years	**Absent**	**Present**	**Total**	**% present**	**p-value**
Gastro-intestinal					
16 - 24 years	6	14	20	70.0	
25 - 42 years	27	253	280	90.4	0.001**
More than 42 years	52	216	268	80.6	
Total	85	483	568	85.0	
Cardio-pulmonary					
16 - 24 years	13	7	20	35.0	
25 - 42 years	128	152	280	54.3	0.003*
More than 42 years	160	108	268	40.3	
Total	301	267	568	47.0	
Skin problems					
16 - 24 years	7	13	20	65.0	

3.3. Relationship between Occupational health hazards and their associated factors

25 - 42 years	66	214	280	76.4	0.18*
More than 42 years	80	188	268	70.1	
Total	**153**	**415**	**568**	**73.1**	
CNS problem					
16 - 24 years	8	12	20	60.0	
25 - 42 years	104	176	280	62.9	0.01*
More than 42 years	134	134	268	50.0	
Total	**246**	**322**	**568**	**56.7**	
Ocular problem					
16 - 24 years	8	12	20	60.0	
25 - 42 years	58	222	280	79.3	0.011*
More than 42 years	82	186	268	69.4	
Total	**148**	**420**	**568**	**73.9**	
Musculoskeletal					
16 - 24 years	7	13	20	65.0	
25 - 42 years	51	229	280	81.8	0.03**
More than 42 years	35	233	268	86.9	
Total	**93**	**475**	**568**	**83.6**	

* Pearson chi-square. ** Likelihood Ratio

A binary logistic regression analysis was performed to assess the relationship between occupational health hazards and a set of ten explanatory variables, namely, age in years, gender, marital status, education level, training on waste management, years of working, awareness of exposure to hazards, working days missed, type of injury and handicap in work. The outcome variable was the presence or absence of occupational health hazards (OHH, Y) (see the equation below). The regression equation $Y = a+b_1$age + b_2 gender + b_3 marital status + b_4 education level + b_5 training + b_6 years of working + b_7 awareness of exposure to hazards + b_8 working days missed + b9 type of injury + b10 handicap in work fitted perfectly (see Table 5) the model **OHH = 4.364 + 0.016 age -1.699 gender - 0.203 marital status -0.253 education level - 1.481 training - 0.282 years of working - 0.634 awareness of exposure to hazards + 1.413 working days missed + 0.006 types of injury + 0.487 handicaps in work.**

We found that three factors were statistically associated with the presence or absence of occupational health hazards in Khartoum locality waste collectors (Table 5). These factors were having training on waste management before starting the job (OR=0.228, 95% [CI: 0.104 - 0.496], p=0.000), missing working days because of OHH (OR=4.108, 95% [CI: 2.285 - 7.384], *p*=0.000) and awareness of being exposed to hazards (OR=0.530, 95% [CI: 0.364 - 0.773], *p*=0.001).

Despite no statistically significant association ($p > 0.05$), the three factors (handicap from work, age of waste collectors, and type of injury) contributed positively to the occurrence of occupational health hazards; contrarily, marital status, education level, years of working and gender seemed to affect the event of occupational hazards. It is important to note that the negative bs of marital status, education level, years of working, and gender indicated that occupational health hazards prevailed more in single waste collectors, those educated in Khalwa, waste collectors working for 1-5 years and male gender.

Factor	B[1]	S.E. [2]	Wald [3]	df[4]	p-value	OR[5]	95% C.I. for OR	
							Lower	Upper
Age in years	0.016	0.016	0.982	1	0.322	1.016	0.984	1.049
Gender	-1.699	1.231	1.906	1	0.167	0.183	0.016	2.040
Marital status	-0.203	0.224	0.819	1	0.366	0.816	0.526	1.267
Education level	-0.253	0.226	1.260	1	0.262	0.776	0.499	1.208
Training on waste management	-1.481	0.398	13.862	1	0.000	0.228	0.104	0.496
Years of working	-0.282	0.351	0.644	1	0.422	0.755	0.379	1.501
Awareness of exposure to hazard	-0.634	0.192	10.876	1	0.001	0.530	0.364	0.773
Ever missed working days	1.413	0.299	22.299	1	0.000	4.108	2.285	7.384
Type of injury	0.006	0.089	0.005	1	0.943	1.006	0.845	1.198
handicap to work	0.487	0.296	2.712	1	0.100	1.627	0.912	2.904
Constant	4.364	1.519	8.260	1	0.004	78.600		

Table 5. Binary logistic regression predicting the occurrence of occupational health hazards based on ten explanatory variables (n=568)

1: Coefficient contribution of the factor under consideration to occupational health hazards. 2: Standard error (a measure of precision). 3: Chi-square in logistic regression. 4: Degree of freedom calculated as the number of variables (factor and OHH) minus 1. 5: Odds ratio quantifying the contribution of the factor under consideration to OHH.

4. DISCUSSION

Five hundred sixty-eight solid waste collectors participated in this study with a response rate of 78%, the male was more predominant (99.3%) than the female, and their ages were between 16-79 years with a median of 42 years. Of these, 53% were in the age range of 16-42 years, and 47% were more than the median age. In a study conducted in Ethiopia, 379 (96.2% response rate) waste collectors were interviewed, the majority of them (64%) were less than 31 years old (mean age), and females were predominant (76%). In Latin America, 1025 waste pickers had a median age of 45, a value comparable to our participant's median age, but the female gender (67% was predominant [3].

We found a high prevalence of occupational health hazards (88.7%) for the waste collectors in the Khartoum locality, indicating the incidence of health problems. Indeed, the total days lost in work was 81.5%, and we found a statistically significant association between the age of participants and types of occupational health hazards; skin disease was an exception. A crosssectional study conducted in Ethiopia about the prevalence of occupational injuries indicated a prevalence of 34.1% though the objectives of the two studies were not the same. Comparatively, waste collectors in the Khartoum locality face more hazards than those in Ethiopia [5].

A binary logistic regression was performed in this study to assess the relationship between occupational health hazards and the ten variables examined here. Results show that three factors (job training, awareness and missing working days) were statistically associated with the presence or absence of OHH. A possible explanation might be that awareness of exposure to hazards and training on waste management increase the attention against occupational hazards, thus improving their

work performance, which might reduce the likelihood of damage.

In contrast, missing working days were positively associated with occupational hazards. Though the statistical association was weak, the other three factors (handicap from work, age of participants, and type of injury) seemed to contribute positively to the occurrence of OHH.

For instance, age is likely to increase vulnerability to health hazards. Finally, four factors (marital status, educational level, gender and years of work) seemed to be negatively associated with occupational hazards. Education is more likely to increase workers' safety, and fewer years of work means less exposure to hazardous situations.

In conclusion, we found a high prevalence of occupational health hazards among municipal solid waste collectors in the Khartoum locality. Lack of job training, absence of medical check ups, working more than five days per week and working continuously for more than 8 hours a day with inadequate personal protective equipment led to different health types of ailments. We recommend that waste collectors be alert and aware of potential health risks arising from their work. Reducing exposure, providing appropriate, complete personal protective equipment, providing them with job training, and reducing and monitoring working days and hours are needed. Along with regular health check-ups, providing medical insurance is also crucial.

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PRELIMINARY ASSESSMENT OF MEDICATION PRESCRIPTION ERRORS IN SOME OUTPATIENTS IN BOSSASO CITY, PUNTLAND, (SOMALIA)

Eskinder Amin Jama Said Muse

ABSTRACT

Medication errors (MEs) are among the most commonly encountered medical mistakes and causes of injury in patients. MEs are defined as" Any preventable event that may lead to inappropriate medication use or patient harm while the medication is under the control of the healthcare professional or the patient." It may occur due to professional practice, health care products, procedures and systems at different stages: prescribing, dispensing and administration. This study aimed to perform a preliminary assessment of medication prescription errors in Bossaso city. The participants (n= 82) were all outpatients and consented to the study. Most of these participants were adults in the age group 36-50 (29.3%), followed by the age group 26-35 (26.8%). The majority of the participants (58.5%) were males. Most of them (41.5%) were married, followed by the single group (25.6%). We found that omission error was more frequent (73%) than commission error. Of the omission errors the most common type was the omission of the prescriber's name 31.6%). Because prescription errors are a threat to patient safety, we recommend that the health authority, doctors, healthcare professionals, and pharmacists realize the importance of creating a culture of patient safety. The introduction of computer-assisted medication prescriptions and raising the awareness of young health professionals might be helpful.

Keywords:

Medication Prescription; omission errors; commission errors; dispensing; administration

1. INTRODUCTION

Various studies showed that prescribing errors are most frequently observed at the stage of the medication delivery process, followed by administration errors, transcription errors, and dispensing errors (1-4). Omission errors, which occur due to missing essential information in the prescription, and commission errors, which occur due to writing of wrong information in the prescription process, are the two types of prescription errors (5). The factors that influence rational prescribing are patients, health care professionals, working environment, drugs supply system, legal regulations, information and misinformation about medicines and profit intentions in selling more medicines (3,6). Inappropriate medication, incorrect dosage or frequency, wrong route, failure to recognize drug-drug interactions, lack of monitoring, missed/late dose errors with delayed drug administration, and inadequate communication are among the commonly reported prescription errors(1,7,8).

Prescription errors are significant sources of irrational use of medicines. Invalid prescribing is unsafe and may lead to ineffective treatment, prolongation of disease, distress to the patient and increased costs of medication (1,7). Moreover, numerous studies reveal that prescription errors lead to an increase in adverse effects of drugs, morbidities, mortalities and burden of treatment costs. Besides this, they also lead to reduced faith of patients towards healthcare providers and increased wastage of public money(4,7,9).

Though many studies (2,6,7,10) related to prescription errors have been conducted in hospitals worldwide, there are no sufficient studies available for low-and middle-income countries like Somalia despite their increased practice of using medications. To our knowledge, no previous study of this nature has been carried out in Bossaso. Hence, this preliminary study is designed to determine medication prescription errors and their associated factors in Bossaso City, Puntland.

2. RESEARCH METHODOLOGY

2.1. Study area and sample size

This study was undertaken with outpatients in Bossaso city, Puntland (Somalia). The city is the headquarter of the Bari region of Puntland state, Somalia and has an estimated population of about 750,000. It provides different healthcare services to the community of Bossaso city with its six major departments including internal medicine, pediatrics, surgery and gynecology. The number of participants whose medical prescriptions were controlled was 82. All the participants consented to the study.

2.2. Data collection and analysis

Three graduating pharmacy students were trained to collect the data on participants' demographic characteristics, medication experience and disease states using standard treatment guidelines and hospital formularies. After data were collected, coding was undertaken before data entry into SPSS version 21.0 for data analysis. The study was conducted from February to April 2022.

3. RESULTS

3.1. Socio-demographic characteristics of the study participants

A total of 82 patients participated in the present study, of which 58.5% were males. Most of these participants were adults in the age group 36-50 (29.3%), followed by the age group 26- 35 (26.8%). The majority of the participants (54.9%)) were from rural areas. Most participants were married (41.5%), followed by the single group (25.6%). Of the total prescriptions, 70.7% of them had Polypharmacy medicines. The socio-demographic characteristics of the participants are reported in (Table 1).

Table 1: Socio-demographic characteristics of the participants (n= 82)

Characteristics	Category	Results (%)
Gender	Male	48 (58.5%)
	Female	34 (41.5%)
Age distribution (years)	18-25	20 (24.4%)
	26-35	22 (26.8%)
	36-50	24 (29.3%)
	Above 50	16 (19.5%)
Marital status	Single	21 (25.6%)
	Married	34 (41.5%)
	Divorced	11 (13.4%)
	Widowed	16 (19.5%)
Educational level	No formal education	45 (54.9%)
	Primary school	10 (12.2%)
	Secondary school	14 (17.1%)
	College and above	13 (15.9%)
Occupation	Unemployed	45 (54.9%)
	Employee	5 (6.1%)
	Private business	8 (9.8%)
	Students	17 (20.7%)
	Daily labourer	7 (8.5%)
Types of visit	New visit	38 (46.3%)
	Repeated visit	44 (53.7%)
Polypharmacy	Present	58 (70.7%)
	Absent	24 (29.3%)

3.2. Types of Medication Prescription Errors

The medication prescription errors were broadly classified as omission and commission errors. Of the 82 prescriptions assessed, 68 patients experienced at least one prescription error. Overall, omission error was more frequent (73%) compared to commission error (27%) (Fig.1).

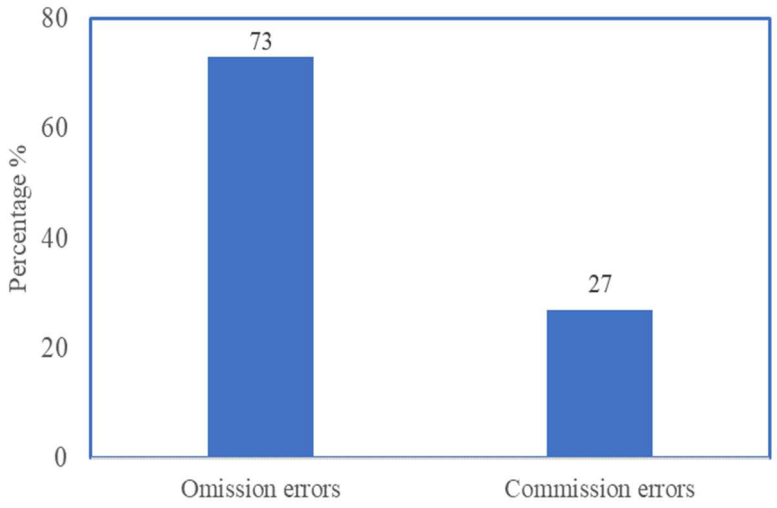

Figure 1. Omission errors were more common than commission errors

Among the omission errors, the most common missed was the prescriber's name (31.6%), followed by missed diagnosis and missed frequency of the drugs, 17.9% and 10.2%, respectively. A detailed description of the omission error types observed in the study is reported in (Fig. 2).

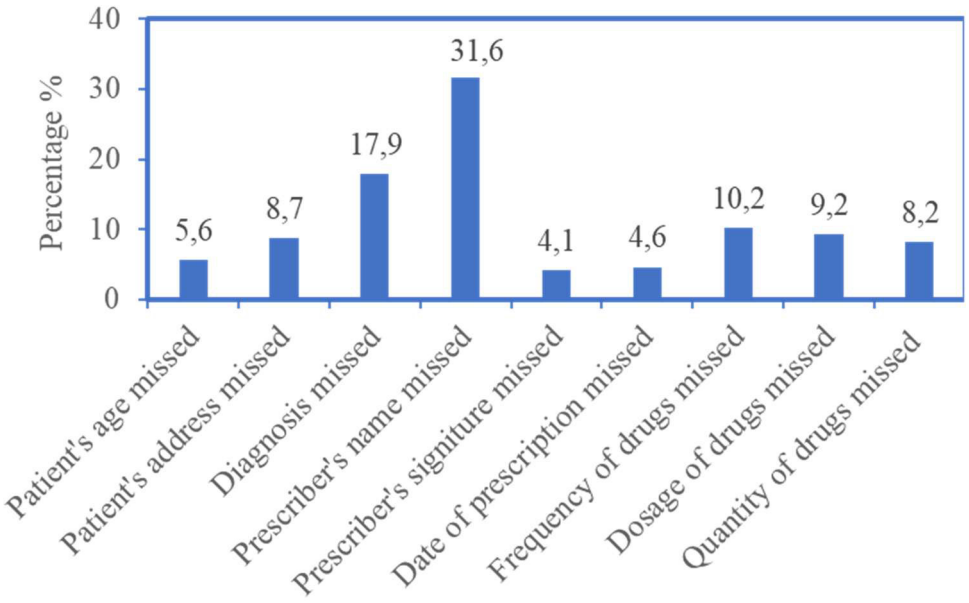

Figure 2. Omission error types observed in this study

Regarding the commission errors observed, the most common type was the frequency error (22%), followed by the wrong dose and wrong indication, which were 15% and 11%, respectively. The commission error types are summarized in figure 3.

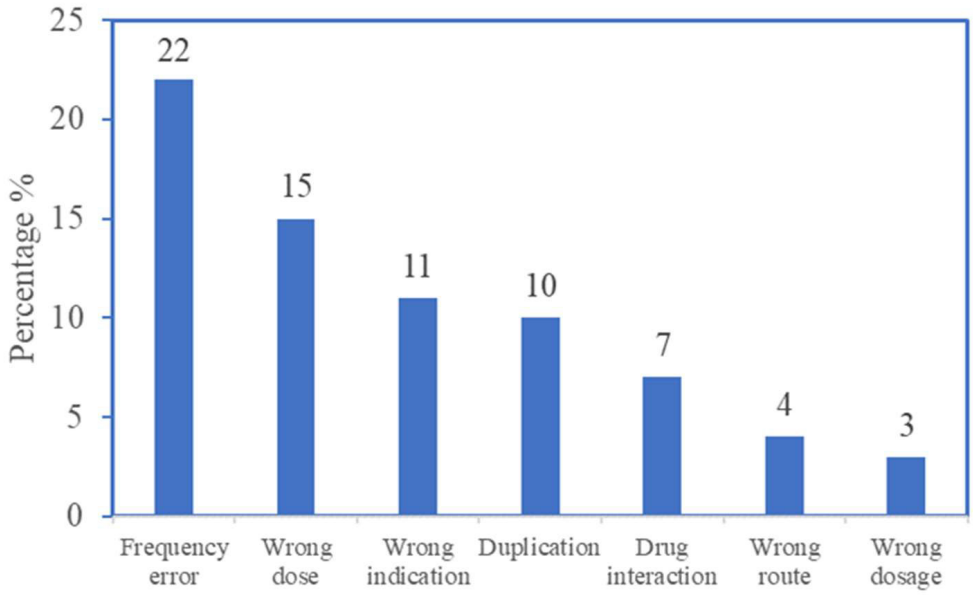

Fig. 3. Commission error types observed in the present study

4. DISCUSSION

This study aimed to make a preliminary assessment of the frequency and type of medication prescription errors in some outpatients in Bossaso, Puntland (Somalia). More than half of the participants of this study were male and belonged to the age group ranging from 36-50 years. We found that omission errors were more frequent (73%) than commission errors (27%). Our finding is in line with previously reported studies (7,11), where omission errors were more frequent than commission errors. These omission errors might be explained by the following factors, increased numbers of patients visiting the hospitals, limited numbers of health care staff, increased workload of the physicians and absence of electronic medication prescription mechanisms. However, the findings of other studies (12,13) were dissimilar to our work, where commission errors were predominant.

Of all errors, the omission of the prescriber's name was the most frequent, followed by wrong frequency prescription (see Figures 2 and 3). This result contrasts with the findings of previously reported studies, where the use of the wrong drugs was the leading prescription error identified (8, 9, 15). These differences might be due to variations in the number of physicians available at each center and the sample sizes employed for medication prescription assessments. The prescription of the wrong dose observed in the present study was found to be lower than the findings reported in Ethiopia (9, 16). Sample size differences at each center, unfavourable environmental conditions, and prescriber unawareness of damage may explain the observed results.

In conclusion, we strongly recommend that the health authority, and health professionals including doctors and pharmacists create and adhere to a culture of patient safety and introduce a computer-assisted medication prescription. Moreover, it is advisable to raise the awareness of young health professionals on the subject matter.

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NOTES