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Full Length Research Paper

Determinants of practices for dengue diagnosis among healthcare professionals working in public hospitals of Abidjan, Cote d'Ivoire

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Dengue has become a major public health concern in Cote d'Ivoire since 2010. In malaria endemic countries, such as Cote d'Ivoire, healthcare workers often confuse dengue with other tropical fevers, such as malaria. However, to control dengue fever, healthcare workers must be knowledgeable about this disease. A cross-sectional study was conducted on 400 healthcare workers' knowledge, attitude, and practices in relation to dengue from 3rd September, 2014 to 20th March, 2015 in Abidjan and its suburbs. Logistic analyses with stepwise selection were performed to explain the relationship between the dependent variable (practices) and the main explicative variable (knowledge). The distribution of participant healthcare workers by health facility showed that 55% worked in reference health facilities. Among the 340 participants, 70 (21%) had a good knowledge of dengue fever, while 71 (21%) had good diagnostic practices. The logistical analysis with stepwise selection showed that practices were explained by knowledge (adjusted OR (aOR) = 2.69; p = 0.004), gender (aOR = 1.88; p = 0.036), occupation (aOR = 0.37; p = 0.003) and epidemic risk perception (aOR = 2.59; p = 0.001). The study shows that nurses had better practices in term of dengue diagnosis compared with medical doctors. Similarly, healthcare workers who had good knowledge of dengue fever also had good practices. However, there is a great need for healthcare workers to be trained on how to detect dengue disease.

Key words: Dengue, practice, knowledge, healthcare workers, Cote d'Ivoire.

INTRODUCTION

Dengue is the most important mosquito-transmitted viral infection (World Health Organization (WHO), 2012;

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Fredericks and Fernandez-Sesma, 2014) with four serotypes in circulation among human (Fredericks and Fernandez-Sesma, 2014; Messina et al., 2014). In Africa, the epidemiology and public health impact of dengue are not well understood or are poorly documented (Amarasinghe et al., 2011; Durand et al., 2000). In Cote d'Ivoire the first human infected case was reported in 1999 (Durand et al., 2000). Prior to that, dengue viral circulation has not been documented in Cote d'Ivoire since the early 1980s (Cordellier, 1984).

In 2008, two dengue cases were confirmed among travelers returning to their home countries from Cote d'Ivoire (a Japanese and a French tourists) (Durand et al., 2000; Moi et al., 2010; Ninove et al., 2009). The strengthening of the epidemiological surveillance led to the detection of a dengue outbreak in 2010 with 23 cases resulting in one death in Abidjan. These events confirmed the existence of the dengue virus in the country and its capacity to culminate in an outbreak.

However, in Cote d'Ivoire as in many African countries, dengue is likely to be overlooked and underreported because of a low awareness among health care providers, the pervasiveness of other febrile illnesses, and lack of diagnostic testing and systematic surveillance (Amarasinghe et al., 2011). This fact is conductive to antimalarial drugs misuse, therapeutic failures and subsequent malaria treatment resistance (Foumane et al., 2015; Shayo et al., 2015; Golassa et al., 2015).

In Cote d'Ivoire, it appears that there is a necessity to put in place a surveillance system for data gathering and the early detection of outbreaks. However, establishing epidemiological surveillance framework for dengue which may enhance its diagnosis and its prevention, required understanding the weakness and strength through capacity assessment, which is, based on the capacities knowledge, practices and behavior of healthcare workers in Abidjan and its suburbs.

The present study is aimed at identifying the determinants of good practices in the diagnosis of dengue among healthcare workers in Abidjan and its suburbs.

METHODS

This cross-sectional study was conducted from 3rd September, 2014 to 20th March, 2015 2015 in public health facilities of Abidjan and its suburbs. It assessed the knowledge, attitudes and practices of healthcare workers. Abidjan is the economic capital city of Cote d'Ivoire, with 4,707,000 inhabitants according the 2014 census (Institut National de la Statistique (INS), 2014). Abidjan has ten townships and two suburbs divided into ten health districts.

The study population was composed of 400 health professionals who worked within the services of general medicine, infectious disease, pediatric and medical emergencies in the public sanitation network of Abidjan and its suburbs. The sample size was calculated with Epitable software version 6.0 (CDC Atlanta) by taking into account the following parameters:

1. Expected prevalence of good practice: 37% (Dhimal et al., 2014)
2. Required accuracy: 5%;
3. Confidence level: 95%;
4. Non-response rate: 10%

The calculated sample size was 397 healthcare workers. A simple allocation scheme was applied. 40 health professionals were interviewed in each health district.

A proportional allocation method was applied for the number of staff from each occupation to take into account sample's representability. Hence, the designed sample included 120 doctors (30%) and 280 nurses (70%). The healthcare facilities were randomly investigated.

The dependent variable was the practices referred to dengue diagnostic among healthcare professionals. Good practice was defined as the capacity of healthcare workers to make differential diagnoses of fever cases, to demand blood samples for laboratory analyses, to research primary or secondary cases in the immediate environment of non-malarial patients, and to identify these cases as a dengue-like disease. The independent variables were socio-demographic status, occupation, knowledge, and attitudes toward dengue.

The data were collected by face to face interviews with a questionnaire developed using the World Health Organization (WHO) guidelines on dengue disease (World Health Organization, WHO, 2009), the Integrated Diseases Surveillance and Response guidelines (World Health Organization, WHO, 2010) and the studies published by Dhimal et al. (2014) in Nepal and Shuaib et al. (2010) in Jamaica. Quantitative questionnaire were administered to each interviewee.

The data analysis was performed with R software version 3.1.2 (2014-10-31). The knowledge and practices variables were scored according to the number and weight of related items included in the questionnaire. Thus, good practices and good knowledge required a minimum score of 60% and worse practices and worse knowledge were scored under 60%. The threshold of 60% to scale knowledge and practices about dengue disease was determined by consensual agreement from national expects in Public health and epidemiology.

With regard to "Attitude", two variables were identified to describe it. Yes/no questions were applied to collect healthcare workers' impressions about their perception of the seriousness of the disease and their perception on the fact that Cote d'Ivoire can be at risk of dengue.

The relationship between the dependent variable and the explicative variables was determined by multiple logistic regressions with stepwise selection. All of the variables with a significance level less than 0.2 (Freitas et al., 2012) in the bivariate analysis were selected for multiple regression. Knowledge was defined as a main variable. The final model contained variables with a significance level of less than or equal to 0.05 after adjustment on other variables. Variables that had a matching strength were kept less than or equal to 0.05. The robustness of the final model was tested by a Hosmer-Lemeshow test with a significance threshold of 0.05.

Ethical considerations

Before the study, the objectives and the methodology of the study was sent in writing to each health facility directorate to obtain their consent. The anonymity of the subjects' data was ensured by using deidentification codes. The data were compiled, and the results presented so as to avoid identification of individual through their answers.

This study did not include any treatments or unpleasant procedures. If a participant refused to answer, there were no negative consequences. There was no risk associated with participation in this study. This was voluntary, and participants did not receive remuneration. Each participant was permitted to end the interview at time without reason and without fear of persecution.

Table 1. Description of the study sample (knowledge, attitude and practice study on dengue among healthcare professionals).

Variable		N (%)	Median (IQR)
Age	23 - 33	98 (29)	37 (33 - 44)
	33 - 37	74 (22)	
	37 - 44	89 (26)	
	44 - 65	79 (23)	
Gender	Female	141 (41)	
	Male	199 (59)	
Experience	0 - 2	70 (21)	6 (2 - 14)
	2 - 10	166 (49)	
	10 - 34	104 (30)	
Occupation	Nurses	224 (66)	
	Doctors	116 (34)	
Specialty	No	294 (86)	
	Yes	46 (14)	
Service	Medicine	251 (74)	
	Pediatrics	89 (26)	
Type of health facility	First contact	154 (45)	
	Reference	186 (55)	
Health zone	West	171 (50)	
	East	169 (50)	
Knowledge	Good	70 (21)	
	Worse	270 (79)	
Practice			
	Good	71 (21)	
	Worse	269 (79)	

RESULTS

Description of the study sample

Out of the 400 health professionals, 340 were effectively investigated, with a participation rate of 85%. The participation rate was 97% among doctors and 80% among nurses. Four doctors (3 males and 1 female) and 37 nurses (20 males and 17 females) abstained from answering the questions, either arguing that their participation had not been approved by their superiors or they were very busy. Nineteen nurses were not investigated because of their work schedule and limited number of staff.

The median age of investigated healthcare workers was 37 years old with an interquartile range of 33 to 44. The age ranged from 23 years old (minimum) to 65 years old (maximum). The respondents were composed of 199 males and 141 females, with a sex ratio (M/F) of 1.41. The median number of years of experience was 6 with an interquartile range of 2 to 14 years (Table 1). Of the 340 respondents, 46 were specialists (14%), of whom 41 (89%) were medical doctors. 56% of the specialists were noted to be pediatricians.

The distribution of healthcare workers by type of health facility showed that 55% of them came from reference facilities, namely general hospitals (GH) and university hospital centers (UHC) (Table 1).

Knowledge, attitudes and practices (KAP)

Seventy (21%) health professionals showed good knowledge score (Table 1). Regarding attitudes, 253 (74%) health professionals knew that dengue was a serious illness (96% doctors and 66% nurses). There were 146

Table 2. Univariate logistic regression (KAP study on dengue among healthcare workers in Abidjan and its suburbs).

Variable	Worse practice	Good practice	OR	CI 95%	p-value*
Age (years)					
23 -33	82	16	1		
33 - 37	59	15	1.30	0.59 - 2.85)	0.063
37 - 44	68	21	1.58	0.77 - 3.31)	
44 - 65	57	22	1.98	0.96 - 4.15)	
Gender					
Female	120	21	1		0.011
Male	146	53	2.07	1.20 - 3.70)	
Service					
Medicine	191	60	1		0.111
Pediatrics	75	14	0.59	0.30 - 1.10)	
Perception of seriousness					
DNK**	77	10	1		0.009
Yes	189	64	2.61	1.34 - 5.64)	
Perception of risk					
DNK**	168	26	1		$2.74\ 10^{-5}$
Yes	98	48	3.16	1.86 - 5.48)	
Source of information					
Other	62	5	1		
Training	115	55	1.19	0.59 - 2.54)	0.107
Press	93	10	1.63	0.77 - 3.60)	
Knowledge					
No	222	48	1		0.001
Yes	44	26	2.73	1.53 - 4.85)	

***,** Only variables with a p-value ≤ 0.2. The variables with a p-value > 0.2 were health zone, years of professional experience and specialty. **Do not know.

health workers who perceived the risk of dengue outbreak in Cote d'Ivoire. In fact, 59% of nurses and 53% of doctors asserted that Cote d'Ivoire was at risk of a dengue outbreak. From a practice's standpoint, 21% of the participants provided answers linked to good practices.

Relationships between the dependent variable and independent variables

It was observed that gender was significantly associated with practices; males had better practices compared with females [OR = 2.07; CI 95% = (1.20 - 3.70)] (Table 2). Additionally, variables measuring attitude, such as perception of disease seriousness [OR = 2.61 (1.34 - 5.64)] and the perception of the risk of dengue outbreak in Cote d'Ivoire [OR = 3.16 (1.86 - 5.48)], were significantly linked to practices.

From the perception of knowledge, health professionals in Abidjan and suburbs who had good knowledge of dengue fever, had also good practices for dengue diagnosis [OR = 2.73; CI 95% = (1.53 - 4.85)].

The following variables were not significantly related to practices: Age (p = 0.063), type of health facility (p = 0.350), service (p = 0.111), occupation (p = 0.350), specialty (p = 0.700), experience (p = 0.260), and source of information (p = 0.107).

Multivariate logistic models design

Table 3 presents the final results of the logistic regression after stepwise selection. After adjustment on other variables, the health professionals who had good knowledge about dengue had also good practices for dengue diagnosis [aOR = 2.69; CI 95% = (1.37 -5.32)].

Ceteris paribus, male healthcare workers had better

Table 3. Multiple logistic regression final model (KAP study on dengue among healthcare professionals in Abidjan).

Variable	Final model			
	Effective (n = 340)	Adjusted OR (aOR)	95% CI	p- value
Knowledge				
No	270	1		0.004
Yes	70	2.69	1.37 - 5.32	
Gender				
Female	141	1		0.036
Male	199	1.88	1.05 - 3.46	
Occupation				
Nurses	224	1		0.003
Doctors	116	0.37	0.18 - 0.70	
Perception of risk				
DNK	194	1		0.001
Yes	146	2.59	1.47 - 4.62	

practices than their female counterparts [aOR = 1.88; CI 95% = (1.05-3.46)]. Medical doctors were found to have worse practices as compared to nurses after model adjustment on other variables [aOR = 0.37; CI 95% = (0.17 - 0.70)]. Likewise, healthcare professionals who asserted that Cote d'Ivoire was at risk of a dengue outbreak had better practices than those who did not [aOR = 2.59; CI 95% = (1.47 - 4.62)].

DISCUSSION

This study was performed to sustain the establishment of a specific surveillance system for dengue. Since the early 2000s, Cote d'Ivoire has declared several dengue outbreaks located in Abidjan and suburbs. Unfortunately, the outbreaks were discovered *a posteriori*. Therefore, it appeared necessary to assess the knowledge and practices of dengue fever among healthcare professionals in Abidjan and its suburbs. The results from this study led us to establish the following findings.

Demographic and professional characteristics

Of the 340 healthcare professionals interviewed, 34% were doctors whereas the majority was nurses (66%). Ho et al. (2013) evaluated a sample in which 51% were doctors and 49% were nurses. Dubé et al. (2011) assessed a sample in which 57% were doctors and 43% were nurses. In Cote d'Ivoire, medical doctors represent 30% of healthcare professionals (SIDA, 2012). Therefore, this study was designed to have representative data from both healthcare occupations.

The distribution by age highlighted that 50% of the health professionals interviewed in Abidjan and its suburbs aged less than 37 years, ranging from 23 to 65 years old. The study population was relatively younger than that of Lee et al. (2011), who performed a study in which 69% of medical doctors were 41 years old. Lee et al. (2011) evaluated a sample with age distribution similar to Tan et al. (2009), who performed a KAP study in Taiwan among doctors on communicable diseases in the private sector. The study found that 83% of the surveyed doctors were more than 40 years old. Jain et al. (2015) found that their sample of healthcare professionals was relatively younger than that of the present study. The difference between the formally cited and the study finding can be ascribed to the fact that this study took into account nurses and medical doctors simultaneously.

The distribution by gender showed that male healthcare professionals were significantly older than female healthcare professionals ($p < 0.0001$). Similarly, doctors were significantly older than nurses ($p = 0.023$). This finding could be explained by the fact that doctors enter the workforce at a relatively higher age, have a longer university curriculum (eight years of study *vs.* three years of study) and receive their pension later than nurses (65 years *vs*. 57 years).

The study found a sex ratio (M/F) of 1.11 among nurses, that is, 53% were men while 47% were women. Among medical doctors, the sex ratio (M/F) was 2.31, with 70% men and 30% women. Ho et al. (2013) found far more males (87%) than females among medical doctors, whereas among nurses, female represented an overwhelming majority (97%).

The results from Ho et al. (2013) study in Taiwan suggest that among healthcare providers there may have been an association between occupation and gender. This result was also corroborated by Tan et al. (2009) study which was conducted in Taiwan among private doctors. Tan et al. (2009) found in their sample that males were predominant (87%). However, the results from Dubé et al. (2011)'s study in Quebec highlighted a

predominance of females in medical professions.

The study found that 31% of health professionals had more than 10 years of experience. In the study published by Ho et al. (2013), 51% of surveyed healthcare professionals had more than 10 years of experience. The respondents in this study also had fewer years of experience than those investigated by Dubé et al. (2011) in Quebec. In fact, 65% of health professionals investigated by Dubé et al. (2011) had at least 15 years of experience.

Three sources were identified from which participants acquired information on dengue. Shuaib et al. (2010) and Dhimal et al. (2014) identified televisions and radios as major sources of information on dengue fever, followed by school. However, the study found that trainings (50%) were the main source of dengue information, followed by other form of press (30%). Furthermore, 25% of the respondents reported getting information on dengue via radio and television. The difference between the study results and those of Shuaib et al. (2010) and Dhimal et al. (2014) might be due to the fact that they conducted surveys on the general population in Jamaica (Shuaib et al., 2010) and Nepal (Dhimal et al., 2014), respectively.

Practice referred to dengue diagnosis among healthcare workers

It was found that good knowledge of dengue was associated with good practices for dengue diagnosis [adjusted OR (aOR) = 2.69; 95% CI: (1.37 to 5.32); p = 0.0041]. Study conducted in general population in Nepal about dengue's knowledge, attitude and practices found a positive correlation between knowledge and practices (Dhimal et al., 2014) A study conducted by Ntambwe on multidrug-resistant tuberculosis among healthcare workers in Maseru (Malangu and Adebanjo, 2015) achieved the same result. This result leads to the belief that education plays an important role in practices enhancement (Merga and Alemayehu, 2015; Saaka, 2014). However in this study, medical doctors had worse practices than nurses [aOR = 0.37; 95% CI: (0.18 to 0.70); p = 0.0030]. This confirms Ho et al. (2013)'s findings in Taiwan. Unlike Ho et al. (2013), Shuaib et al. (2010), found that education cannot always be correlated with knowledge. The explanation of this difference in this study can be found in the fact that in Cote d'Ivoire, nurses are more involved in the epidemic-prone diseases surveillance than medical doctors. Males from this study were found to have significantly better practices than females [aOR = 1.88; 95% CI: (1.05 to 3.46); p = 0.0357]. In Tawain, Tan et al. (2009) reported similar findings but with no significant correlation. The perception that Cote d'Ivoire can be at risk of dengue epidemic was positively associated with good practices [aOR = 2.59; 95% CI: (1.47 to 4.62); p = 0.0011]. Some studies conducted on other epidemic diseases such as influenza demonstrated that the perception to be at risk of a threat strengthen the practices (Lau et al., 2010; Hollmeyer et al., 2009).

LIMITATIONS

The investigation used a sampling method that allotted an equal number of participants for each investigated district. This may have induced an increased non-response rate because some districts had lack of healthcare professionals, leading the study to have a possible limiting ability to detect certain associations or an overestimation of certain relationships. However, the selection of institutions was essentially randomly-based, and the 85% participation rate may have limited potential bias.

Conclusion

Dengue fever remains a misunderstood disease in sub-Saharan Africa, particularly in Cote d'Ivoire. The study was mainly descriptive in nature and the design allowed the identification of healthcare professionals from Abidjan and its suburbs who were able to diagnose dengue as part of the surveillance of epidemic-prone diseases. The results of the multiple logistic regression model have established that the practices of healthcare professionals in Abidjan and its suburbs are linked to occupation. Therefore, nurses had better practices for dengue diagnosis than medical doctors. This study shows that there is a need to train healthcare workers in Cote d'Ivoire in terms of diagnostic capacities for fever diseases. Also for the better accomplishment of this screening, in all level of health facilities some rapid tests must be applied to triage patients.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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Barber's knowledge and practice of biological hazards in relation to their occupation: A case of Hawassa Town, Southern Ethiopia

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Many health hazards plus other contagious diseases and skin infections are related to barbers' occupation, to which their clients are exposed to. Barbers' awareness and practice plays a vital part in the hindrance and management of these health related risks. The objective of this study is to assess the knowledge and practice of barbers regarding biological hazards related to their occupation in Hawassa Town, Southern Ethiopia. This is a cross-sectional study conducted from September 1st, 2014 to January 31st, 2015. The overall number of barbers within the town was 1360, of which 516 barbers participated in this study. The sample size determination was done using the formula for a single population proportion by considering 51% knowledgeable barbers from – Jimma Ethiopia, 95% level of confidence with 5% margin of error. About 15% of the none-response rate was added in this study. The systematic random sampling technique was implemented during data collection. By using structured and pre-tested questionnaires, face to face interview was applied to determine knowledge level of the participants. Different statistic methods like multivariate logistic regression were conducted to spot factors associated with knowledge and practice of barbers. Of the 516 barbers, 515 (99.9%) had smart knowledge on biological hazards associated with their profession, whereas 369 (71.5%) practice safe during barbering. An academic status, holder of the business, operating hour and toil expertise of the barbers were associated considerably with the knowledge of the barbers. However, the practices of the barbers were related solely through handiness of ultraviolet (UV) sterilizers in the room and toiling hour. Long practices of barbers with smart knowledge have good association with forestall biological hazards on their profession. However, giving more coaching to the barbers is necessary to prevent biological risks related to their occupation.

Key words: Barbers, hazards, occupation, knowledge, practice, Hawassa.

INTRODUCTION

The term barber is derived from the Latin word *barba* meaning beard. A person whose occupation is hair cutting, shaving and trimming of beards is called barber (Http://www.wikipedia.org.com, 2013). The common risk

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factors in barbers' occupation are razors, scissors, nail files and baby piercing instruments. In the rural area, the barbers are involved in circumcision, incision and drainage of abscesses (Waheed et al., 2011).

The main service of the barber shop is shaving, haircutting and hair reforming for men using different sharp materials. There is need to give attention to the use of sharp instruments at different sites including barber house to minimize the risks of blood borne infections like viruses. It is a serious health problem for both barbers and their clients (Wazir et al., 2008; Khandait et al., 1999).

The barbers' work related infection remains the major cause of morbidity and mortality in human beings particularly in developing and underdeveloped countries due to poverty and overcrowding. Even though many infectious diseases are preventable and treatable in developing countries, personal and environmental hygiene, ignorance and poor political commitments persist (Wazir et al., 2008, Khandait et al., 1999).

An ancient profession called barbering is intensively associated with the use of blades, towels, knives and combs, etc. If these are not appropriately disinfected, it leads to transmission of a range of infections, which include fungal infections, infestations of head louse, scabies, staphylococcus infection, human immuno-deficiency virus (HIV), hepatitis B and C viruses, etc (Amodio et al., 2010). A large number of residents receive services from barbers in our society. Barbers' profession and work place may be a possible group for the spread of various infections related to their job to which their visitors are exposed (Beyen et al., 2012). Hence, awareness about these health hazards among barbers would play a vital role in the prevention and control of these infections. The purpose of our study is to assess awareness among barbers regarding health hazards related to their profession and to identify practices linked to acquisition of infections in barbers' shops.

METHODS

Study design

Cross sectional study was carried out in Hawassa town involving all barbers with the help of pretested questionnaire through interview method.

Study area

The study was conducted in selected 8 sub-cities of Hawassa town found in the technology village of Hawassa University in Sidama Zone, Southern Ethiopia. It was conducted from September 1st 2014 to January 31st, 2015.

Source population

The source and study population were all barbers in 8-sub cities of Hawassa town.

Study population

The study population was actively working barbers in the selected sub-city where the actual sample is drawn from.

Sampling strategy

Approximately 1360 barbers render services to the residents in the town. Five hundred and sixteen barbers were randomly selected to participate in this study. About 65 barbers were interviewed from each sub-city. The structured number and name of the barber's house were obtained using systematic random sampling system. From each barbers' house, the clients participated in this study using lottery system. The sample size was determined using the formula for single population proportion by considering 51% proportion of knowledgeable barbers (Zewudie and Kurkura, 2002) with 95% level of confidence. Five percent (5%) margin of error and 15% of none response rate were included.

Inclusion and exclusion criteria

An individual worker assisting the main workers was excluded. All permanent barbers were included.

Data collection

A standardized pre-tested questionnaire was provided to the workers, and was convinced to provide actual information during interview.

Data quality management

Ethical clearance was obtained from the institutional ethical committee. Voluntarily participated individuals were clearly informed about the purpose of the study. An informed consent was obtained from the willing participants. Only the consented individuals were involved. A structured and pretested questionnaire was used for the study which included the personal details of the participants such as age, education, income, duration of profession and knowledge of risk factors of their occupation.

Data were collected by interview method and by informal inspection of workplace, after informed consent was taken. Data collected were tabulated in Microsoft excel sheet, and statistical analysis was done using Open-Epi info software. Chi-square test was applied for proportions of $p<0.05$ considered for level of significance.

Ethical clearance was obtained from College of Medicine and Health Sciences, Hawassa University-Institutional Ethical Review board IRB, and consent form was signed by each individual before data collection.

RESULTS

Socio-demographic characteristics of barbers

The response rate of this study was 100%. A total of 516 study subjects were included in this study, among which 410 (79.5%) were males and the remaining were females. About 218 (42.2%) were singles, 290 (56.2%) were married and 8 (1.6%) were divorced. The mean (standard deviation) age was 26.8 (±3.12) years (ranging from 15 to 38 years). The average numbers of barbers

Table 1. Socio demographic characteristics of barbers in Hawassa Town.

Variables		n (%)
Age	17-19	2 (0.4)
	20-24	104 (20.2)
	25-29	300 (58.1)
	30-34	104 (20.2)
	35-39	6 (1.2)
Sex	Male	410 (79.5)
	Female	106 (20.5)
Religion	Orthodox	253 (49.0)
	Protestant	251 (48.6)
	Muslim	9 (1.7)
	Others	3(0.6)
Education	Grade 1-8	7(1.4)
	Grade 9-10	297(57.6)
	Grade 11-12	86(16.7)
	12 and above	126(24.4)
Marital status	Single	218 (42.2)
	Married	290 (56.2)
	Divorced	8 (1.6)
Working hours per day	≤8	36 (7.0)
	>8	480 (93.0)
Work experience	<1year	94 (18.2)
	1-3	189 (36.6)
	3-5	124 (24.0)
	>5 years	109 (21.1)
Number of barbers per shop	only 1	148 (28.7)
	>1	368 (71.3)
Holder of the barbers	My Own	66 (12.8)
	Share holder	90 (17.4)
	Haired by others	360 (69.8)
TV/Radio access	Yes	396 (76.7)
	No	120 (23.3)
Towel sterilization access	Yes	131 (25.4)
	No	385 (74.6)
UV sterilization	Yes	485 (94.0)
	No	31 (6.0)
Took training	Yes	510 (98.8)
	No	6 (1.2)

per house were four. Everyday mean (standard deviation) revenue of the participants was 27.65 (±19.32) Ethiopian birr. The dominant religions of the study participants were orthodox 253 (49.0%) and protestants 251(48.6%). About 396 (76.7%) respondents have TV and radio in their working rooms (Table 1).

Knowledge level of the barbers

Five hundred and fifteen 515 (99.8%) respondents had

Table 2. Source of information regarding biological hazards related to barbers' work.

Variables	Yes, n (%)	No, n (%)
Television	213 (41.3)	303 (58.7)
Newspaper	71 (13.8)	445 (86.2)
Radio	3 (0.6)	513 (99.4)
Health care centers	215 (41.7)	301(583)
From training	14 (2.7)	502(87.3)

good knowledge about diseases transmission mechanisms from person to person during their work. They knew the existence of biological hazards related to their profession and source of infection from different sources; for instant from health care center, 215 (41.7%), television (TV) 213 (41.3%), from training related to health and safety, 14 (2.7%), by reading newsletters related to health and safety 71 (13.8) and from radio 3 (0.6%) (Table 2). Four hundred and twelve, 412 (79.8%) and 383 (74.2%) participants had good knowledge about human immunodeficiency virus (HIV/AIDS) and dandruff (Table 3).

However, the remaining had relatively less knowledge about fungal infection, 131(25.4%), viruses like Ebola, 97 (18.8%), HBV and HCV, 4 (0.8%), head lice, 56 (10.9%) and other skin infections, 22 (4.3%); for the others, there was a poor knowledge about eczema, allergy, staphylococcus and streptococcus.

Barbers' practice to prevent biological hazards

About 147(28.5%) respondents do not wash hands for new customers, while 79 (15.3%), 38 (7.4%), 71 (13.8%), 61 (11.8%), 60 (11.6%) and 3 (0.6%) neither change nor sterilize razors, shavers, scissors, brushes, combs and towels while barbering the hair of different customers, respectively. Of the total study participants, 79 (15.3%) neither wash nor change apron for new customers during barbering (Table 4). In general, only 98 (18.9%) participants practice safe while barbering.

More than 369 (71.5) work safely all the way while barbering the hair of different customers. In this study, about 496 (97.3%) prefer dry hot oven sterilization technique to autoclaving, 12 (2.4%) and 2 (0.4%) direct flaming. About 515 (99.8%) barbers commonly apply disinfection on their daily practice. However, only 147 (28.5%) use alcohol and 365 (70.9%) use bleach called "Barakina". 418 (81.2%) get their disinfectants from any unknown shops, while about 318 (61.7%) of them do not know the concentration of their disinfectants at all. Even though 447 (86.8%) of the Hawassa town barbers are inspected, the lion share of the inspection is done by health professionals, 482 (93.6%) from the health center.

About 258 (50%) of the barber houses are inspected every 6 months (Table 5).

DISCUSSION

This study reveals the biological hazards associated with barbers' knowledge and practice of their work in the Hawassa town, Southern Ethiopia. Thus, out of the total study subjects, about 515 (99.8%) have good knowledge about biological hazards related to their work, which is higher than the studies done in Gondar, Ethiopia (78%) (Beyen et al., 2012), Jimma, Ethiopia (51%) (Zewudie and Kurkura, 2002) , Pakistan, Kharian City of Gujrat District (42%) (Wazir et al., 2008), Rawalpindi and Islamabad (39.6%) (Waheed et al., 2010), Bahra Kahu, Islamabad (38%) (Chaudhry et al., 2010) and Nigeria (24.8%) (Ibrahim and Tanimomo, 2007). One of the possible reasons causing disparity in the knowledge level could be the amount of health hazards covered to measure the awareness of the barbers by the studies. This study covers more health hazards than affirmed studies.

Correspondingly, the study was conducted in Ethiopia, Gondar on knowledge of HBV/HCV (11%), *Staphylococcus* and *Streptococcus* (0%) (Beyen et al., 2012). Moreover, less knowledge was observed in our study as compared to the study conducted at Gondar, Ethiopia on HIV transmission. This may be due to less information from different sources. However, it is better with the study conducted in Nigeria, Ibadan on knowledge of HIV (16.7%) (Arulogun, 2009).

Even though the access to TV/radio is better in Hawassa barber shop (76%) than Gondar, Ethiopia (13%) (Beyen et al., 2012), they get less information from TV/Radio about health hazards. This may be due to less attention given to TV/Radio programs. This study showed that there is a considerable relationship between barbers' knowledge about biological hazards to their work and educational level (Table 6). Barbers who had an education status of 12 and above, secondary 9-10 and secondary 11-12 were two times more likely to have good knowledge about biological hazards interrelated to their work as compared to those with primary educational status [AOR=2.25, 95% CI: 1.69, 6.80], [AOR=3.28, 95% CI: 1.58, 6.54] and [AOR=3.60, 95% CI: 1.01, 8.52], respectively.

The result is consistent with the study conducted in Jimma Ethiopia (Beyen et al., 2012), Pakistan, Kharian City of Gujarat (Wazir et al., 2008), Rawalpindi and Islamabad (Chaudhry et al., 2010) and Nigeria, Ibadan (Arulogun, 2009) which suggests that barbers who had higher schooling were found to have better information on health hazards related to barbering indirectly from their formal education.

A barber employed by others are more than 4.85 and 1.89 times more likely to have knowledge about biological hazards related to their work as compared to those who

Table 3. Knowledge of barbers on each biological hazard related to their work.

Health hazards	Good knowledge, n (%)	Poor knowledge, n (%)
Dandruff	383(74.2)	133(25.8)
Fungus	131(25.4)	385(74.6)
HIV/AIDS	412 (79.8)	104(20.2)
HBV/HCV	47 (9.1)	469 (90.9)
Staphylococcus	0	516(100)
Streptococcus	0	516(100)
Ringworm	0	516(100)
Ebola	97 (18.8)	419 (81.2)
Head lice	460 (89.1)	56(10.9)
Other skin infection	24 (4.7)	492 (95.3)

Table 4. Barbers' practice to prevent biological hazards.

Practice of barbers	Yes, n(%)	No, n(%)
Use of Antiseptic lotion	516(100)	0(0)
Separate set of instruments for each costumer	478 (92.6)	38 (7.4)
Use sterilization before	514 (99.6)	2(0.4)
Use sterilization now	510 (98.8)	6 (1.2)
Disinfecting instruments after the use	502(97.3)	14 (2.7)
Use disinfection currently	515(99.8)	1(0.2)
Use clean towels	501(97.1)	15 (2.9)
Use clean comb	492(95.3)	24 (4.7)
Comb cleaned after using for each costumer	438 (84.9)	78 (15.1)
Use new blade for each costumer	448(86.8)	68 (13.2)
Wash hands for new customers	369 (71.5)	147(28.5)
Change or sterilize razors	437(84.7)	79(15.3)
Change or sterilize shavers	478(92.6)	38 (7.4)
Changing or sterilize scissors	445(86.2)	71 (13.8)
Change or sterilize brushes	455(88.2)	61(11.8)
Change or sterilize combs	456(88.4)	60 (11.6)
Change or sterilize towels	513(99.4)	3 (0.6)
Change or sterilize apron	437(84.7)	79(15.3)

Table 5. Observational result of barbers' practice to prevent biological hazards.

Variables	Yes, n(%)	No, n(%)
Disposal of used sharps and cut hairs	508 (98.4)	8(1.6)
Access of municipality dustbin	503 (97.5)	13(2.5)
Access of water supply	515 (99.8)	1(0.2)
Access of electric supply	516 (100)	0 (0)
Sound pollution	235 (45.5)	281(54.5)
Access of TV/Radio	396 (76.7)	120 (23.3)
Room decoration	384(74.4)	132(25.6)
Access of Newspaper/magazine	401(77.7)	115(22.3)
Towel sterilizer access	158(30.6)	358 (69.4)
UV sterilizer access	249(48.3)	267(51.7)
Access of sink	249(48.3)	267(51.7)
Access of first aid kit	157(30.4)	359(69.6)

Table 6. Risk factors associated with barber's knowledge and biological hazards.

Variables		Knowledge				
		Good n	Poor n	Crude OR (95% CI)	Adjusted OR (95% CI)	P-value
Education	12 and above	8	118	4.68(2.08,17.66)	2.25(1.69,6.80)	0.002
	Secondary (11-12)	6	80	5.88(2.27,18.16)	3.28(1.58,6.54)	0.038
	Secondary (9-10)	102	195	6.72(3.69,28.44	3.60(1.01,8.52)	0.029
	Primary (1-8)	5	2	1		
Working hour	≤8hrs	76	168	1		
	>8hrs	34	238	2.44(3.02,9.80)	2.11(1.99,5.75)	0.000
Work experience	<1 year	16	60	1		
	1-3 years	14	150	1.65(2.64,9.00)	1.45(1.33,7.25)	0.000
	3-5 years	8	194	2.50(2.14,6.03)	2.61(2.44,9.89)	0.000
	>5 years	12	72	3.02(1.89,8.80)	2.80(2.33,8.23)	0.000
Owner of the barbers	My own	14	52	1		
	Shared	38	52	2.41(1.89,4.89)	1.89(1.46,4.88)	0.006
	Employed by others	26	334	3.86(2.08,10.68)	4.85(1.89,11.60)	0.001
Number of barbers per shop	Only 1	46	102	1.88(1.24,4.25)		
	>1	28	340	1		
Availability of UV sterilizers	Yes	45	440	1.00(0.40,1.4)		
	No	12	19	1		
Took training	Yes	60	550	2.40(1.46,4.48)		
	No	2	4	1		

are self-owners [AOR=4.85, 95% CI: 1.89, 11.60]. Similarly, the shared barbers' owners have more knowledge than self-owners [AOR=1.89, 95% CI: 1.46, 4.88]. The likely reason of this is the barbers' knowledge disparity between these groups and educational levels of the groups. Different studies showed that the shared barbers need higher education level to provide better service.

Barbers who spend less than eight hour per day on work are likely to have knowledge about biological risks related to their occupation as compared to those who spend more than eight hour per day on work [AOR=2.11, 95% CI: 1.988, 5.745]. This result is contradicting with the study conducted in Jimma, Ethiopia, Pakistan, Kharian city of Gujrat (Wazir et al., 2008). This might be because those who have more experience in their daily work are exposed to the problems and know the source of biological hazards. Moreover, they may have good access to media since they have media line in their working place.

According to this study, barbers who had better job practice know the risks of the biological hazards very well. Therefore, more than five years, 3-5 years and 1-3 years were more than two times more likely to be knowledgeable about biological hazards associated with their labor than those who had one or less work experience [AOR=2.80, 95% CI: 2.33, 8.23], [AOR=2.61, 95% CI: 2.44,9.89] and [AOR=1.45, 95% CI: 1.33,7.25]. This result is in line with studies conducted in Jimma, Ethiopia, Pakistan, Kharian City of Gujrat (Wazir et al., 2008). The barbers are more experienced as they encounter hazards and have increased knowledge.

In this study area, the barbers' practice to decrease biological hazards related to their work is slightly low. Accordingly, about 369 (71.5%) practice safe to avert biological risks associated with their work.

This finding is higher than the studies conducted in Jimma Ethiopia, Pakistan; Kharian City of Gujrat District (Wazir et al., 2008), Bahra Kahu, Islamabad (Chaudhry et al., 2010), Rawalpindi and Islamabad and Sana'a City, Yemen (Al-RabeeI and Dallak, 2011). However, the stated studies used a solitary practice to define the practice of the study subjects.

This study also revealed that the presence of UV light more likely supported the barbers to practice safely in their working room than those who had no UV light (Table 7). Also, those barbers who spent more than 8 h a day on work were more than three times likely to apply safety knowledge to avert biological hazards associated with their work as compared to those who spent eight or less hours on work. The likely explanation for this could be that barbers who work more than 8 h per day got more

Table 7. Risk factors related to barbers' practice towards prevention of biological hazards.

Variables		Practice				
		Safe n	Unsafe n	COR (95% CI)	AOR (95% CI)	P-value
Presence of UV sterilizer	Yes	57	263	4.91(2.09,8.66)	2.88(1.48,5.52)	0.003
	No	22	174	1		
Presence of towel sterilizer	Yes	25	63	3.42(1.80,6.20)		
	No	54	374	1		
Working hour	≤8hrs	18	232	1	1	
	>8hrs	61	205	4.12(2.21,10.12)	3.25(1.49,7.35)	0.000

OR= Odds ratio, COR= crude OR, AOR=adjusted OR.

profits so that they can buy safety materials like ultra violet light sterilizer machine which are significant to remove health related hazards.

There were certain limitations in this study, depending on self- reported data of the participants which was liable to social desirability bias under or over estimation. Also, this study has not addressed the effect of attitude of the barbers on awareness and performance or practice. Although, this study tried to address some important factors, duration for sterilization and the type of chemical disinfectants were not addressed. Also, this study did not address the microbiological analysis.

Conclusions

In conclusion, the knowledge level of the employed barbers in Hawassa area was very good; however, greater part of the barbers practice is risky during their work.

Accessibility of UV sterilizers, advanced equipment in the barbers' room and more working hours had significant association with the application of the barbers. Also, educational level, being self -owners, working hours and work experience had significant association with the knowledge of the barbers. Thus, provision of training on advancement of their knowledge minimizes the health risk related to their occupation. Also, it is better to address microbiological analysis of the tools that they use in barbering room.

CONFLICT OF INTERESTS

The authors declare that there is no conflict of interest.

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