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# JOURNAL OF PUBLIC HEALTH AND EPIDEMIOLOGY

## Table of Content

**Tinea capitis: A tropical disease of hygienic concern among primary school children in an urban community in Nigeria**

Olusegun Temitope Afolabi, Olumayowa Oninla and Funmito Fehintola

**Seroprevalence of Chlamydia trachomatis infection among pregnant women attending antenatal clinics within Kaduna metropolis, North-Central, Nigeria**

Garba, B. F., Abdulsalami, M. I. and Egbe, N. E.

**Assessment of major causes of heart failure and its pharmacologic management among patients at Felege Hiwot referral hospital in Bahir Dar, Ethiopia**

Melkamu Ayana Zeru

**Quality of tuberculosis treatment services in public hospitals of Sidama Zone, Southern Ethiopia, 2016**

Shibiru lencho Megene, Elias Ali Yesuf, Dejene Melese and Zalalem Kaba Babure

**Occurrence of diarrhea and utilization of zinc bundled with ORS among caregivers of children less than five-years in Addis Ababa, Ethiopia**

Solomon Hassen, Jemal Haidar and Agajie Likie Bogale

*Full Length Research Paper*

# ***Tinea capitis*: A tropical disease of hygienic concern among primary school children in an urban community in Nigeria**

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***Tinea capitis* is the most common dermatophyte infection in school age children in developing countries and is known to impact negatively on their health and well-being. This study determined the prevalence of *T. capitis* and its relationship with hygiene among primary school pupils in Ile-Ife. This descriptive cross-sectional study recruited randomly selected pupils from public and private schools in Ile-Ife from March to April 2017. The data was collected with the use of a pre-tested interviewer-administered questionnaire on hygiene followed by physical examination. Children with a clinical diagnosis of tinea capitis had scalp and hair scrapings for microscopy and culture. Data were analyzed using descriptive and inferential statistics. A total of 420 pupils participated, 240 (57.1%) males and 180 (42.9%) females aged between 4 and 16 years. The overall prevalence rate of *T. Capitis* infection was 21.7% with etiological agents consisting of *Epidemophyton floccosum* (12.0%), *Microsporum gypseum* (7.7%) and *Trichophyton mentagrophytes* (7.7%) while 33% grew *Aspergillus niger* (a contaminant) and no organism was isolated in 36 (39.6%) clinically diagnosed cases. The infection was prevalent among pupils sharing combs, had close contact with animals, playing with sand and lower socio-economic status. School type and personal hygiene were the major determinants of tinea capitis infection. Prevalence of *T. capitis* infection among school children was high and the infection is associated with poor level of hygiene and low socio-economic status. Health promotion and health education interventions are needed to promote good hygiene, early identification and treatment of the infection.**

**Key words:** *Tinea capitis*, primary school children, poverty, hygiene.

## **INTRODUCTION**

*Tinea capitis* is a fungal infection of the scalp. It is an important infective superficial dermatological disease of

worldwide distribution among children. The fungus is either within the hair shaft (endothrix) or spread out over

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the hair surface (ectothrix). *Tinea capitis* usually gives dull gray, circular patches of alopecia, scaling, itching, and often with a black dot (Brooks et al., 2010).

*T. capitis* is much common in children, especially those of black African origin, whose scalp and hair seems more susceptible to fungal invasion (Kumar and Clark, 2009).

In the tropics, tinea capitis is usually aesthetically unacceptable, as it "can be unsightly or disfiguring" (Fathi and Al-Samarai, 2000). In Nigeria, its prevalence has been correlated with the warm humid climate, crowded living, poor sanitary condition of majority of the populace, which has been enhancing the spread of the disease (Ayanlowo et al., 2014).

*T. capitis* is a not a notifiable disease in Nigeria but it is a cause for concern due to its contagious nature. It inflicts a lot of psychosocial trauma due to attached social stigma as well as representing a potential source of secondary bacterial infection if not adequately treated. It is endemic in Nigeria and many factors have been attributed to the spread of this condition which includes warm and humid conditions, poor socioeconomic status of the majority of the populace linked to poor environmental sanitary conditions (Anosike et al., 2005).

The aetiological agents vary from one geographical location to another. In Africa, *Microsporum audouinii* and *Trichophyton soudanese* are predominant (Ameen, 2010; Anosike et al., 2005; Ayanbimpe et al., 2003). In the western regions of the world, *Trichophyton tonsurans* has emerged the predominant cause of *T. capitis* (Ameen, 2010). Variations have been observed even within the country (Akinboro et al., 2011; Enendu and Ibe, 2005; Ayanbimpe et al., 2003).

Attention is not drawn to it because of the relatively benign course of the disease and also not being a notifiable disease. Thus, the actual prevalence figures are unknown in many endemic areas (Anosike et al., 2005). Variety of treatments have been formulated by the locals and applied, majority of which are largely ineffective and has contributed to its relative persistence in this community.

Ringworm of the scalp is presently one of the commonest dermatophytoses in Nigeria. Published reports are however very scanty in this area and a major study in Ile-Ife was last conducted in 1985 (Ajao and Akintunde, 1985) which focused mainly on the prevalence of the disease and the aetiological pathogens. Other studies had also looked at prevalence without relating it to hygiene. This study however intends to assess the prevailing situation of *T. capitis* and its relationship with level of hygiene.

## MATERIALS AND METHODS

Cross-sectional study was conducted at Ife Central local Government Area of Osun State, Nigeria among primary school

pupils during the months of March and April, 2017. The minimum sample size was determined by using the formula for calculating sample size for single proportions (Araoye, 2003).

$$n = \frac{p(1-p)Z^2}{\sigma^2}$$

n – desired sample size

z – confidence level which corresponds to the standard normal deviate usually set at 1.96

p – Prevalence = 45% that is, 0.45 (Dogo et al., 2016)

σ – Error margin i.e. a degree of accuracy required and usually sets at 5% that is, 0.05

$$n = \frac{0.45(1 - 0.45) \times (1.96)^2}{(0.05)^2} = 380.16$$

n = 380 (which was rounded off to 420 to allow for attrition of 10%)

A list of all the private and public primary schools in Ife central area was retrieved from the Local Inspectorate of Education office. It contained a total of 36 public schools and 20 private schools. Multi-stage sampling technique was employed to select the respondents. At the 1st stage, schools were stratified into private and public thereafter at the 2nd stage, 4 schools each were selected from both public and private schools from a list of schools making a total of 8 schools using a simple random sampling technique. At the 3rd stage, 210 pupils each were selected to participate from public and private schools using sampling proportionate to size based on enrolment in each school. In each of the schools, pupils from all levels were selected randomly from class list.

Pupils of public and private primary schools whose head teachers accepted to participate in the study were enrolled in the study while pupils who were ill or not willing to participate in the study were excluded. An interviewer-administered questionnaire was used to assess the pupils' personal and school hygiene. The questionnaire contained 2 sections: biodata and hygiene practices of pupils. Information on the educational status of the mother and the job description of the respondent's father was also collected and used for socioeconomic stratification into social class 1 to 5 (Oyedepi, 1985).

In this study, class 1 and 2 were grouped as upper social class, class 3 as middle social class while class 4 and 5 were grouped as lower social class to aid data analysis. Personal hygiene score was calculated by scoring individual pupil's bathing frequency, frequency of washing hair with soap, comb sharing, frequency of hair-do, playing with sand and playing with domestic animals. The scores were categorized as poor (0 to 2), average (3 to 5), good (6 to 9). The internal consistency was assessed using Cronbach's alpha and split half technique. Cronbach alpha was 0.51 which was fair and split half had equal loading.

A physical examination was also conducted to assess students for *T. capitis* by a public health physician who assessed the following characteristics (scaly patches on the scalp, with or without hair loss; partial hair loss with broken-off hairs, brittle and lusterless hair strands, annular lesions with fairly sharp margins, massive scaling and folliculitis). Skin scrapings from the active edge of the lesion were taken into a sterile blotting paper using the edge of a glass slide from those with features suggestive of *T. capitis*. Samples were thereafter taken for mycological examination. Identification of all specimens taken from the scalp were done by direct microscopy with 10% potassium hydroxide. Specimens were cultured in sabouraud dextrose agar impregnated with chlorhexidine and the samples were then inoculated into separate petri dishes

**Table 1.** Socio-demographic characteristics of respondents.

Variable	Frequency (N=420)	Percentage
<b>Age group</b>		
4-6	145	34.5
7-9	168	40.0
10-12	73	17.4
13-16	34	8.1
<b>Sex</b>		
Male	240	57.1
Female	180	42.9
<b>Ethnicity</b>		
Yoruba	220	52.4
Igbo	100	23.8
Hausa	60	14.3
Others	40	9.5
<b>Religion</b>		
Christianity	200	47.6
Islam	166	39.5
Others	54	12.9
<b>Mothers' highest level of education</b>		
None	70	16.7
Primary	180	42.9
Secondary	120	28.6
Tertiary	50	11.9
<b>Social class</b>		
Upper	76	18.1
Middle	200	47.6
Lower	144	34.3
<b>School type</b>		
Private	210	50.0
Public	210	50.0

and incubated at 37°C for 3 to 4 weeks. Data were analyzed using IBM-SPSS version 20. Univariate analysis was carried out to determine the socio-demographic distribution of study participants through the use of frequency tables and percentages. Chi-square test was carried out to determine significance of association while a binary logistic regression analysis was done to ascertain the determinants of *T. capitis* and p-value was significant at <0.05.

Ethical clearance was obtained from the Ethics committee of the Institute of Public Health, Obafemi Awolowo University, Ile-Ife (HREC number: IPHOAU/12/657). Permission was taken from the Local Inspectorate of Education office and school authorities. Informed consent was obtained from parents while assent was taken from the pupils. All patients with *T. capitis* were treated with topical antifungal agent (Whitfield's ointment, which contains 6% w/w benzoic and 3% w/w salicylic acid).

## RESULTS

Table 1 showed that two-fifth of the respondents (40%) were within the age group of 7 to 9 years. Majorities were of the Yoruba ethnicity (52.4%) and were in the middle social class (47.6%) while mother's highest level of education was primary school (42.9%). Table 2 showed the prevalence of *T. capitis* was 21.7%. *Aspergillus brasiliensis* a contaminant was the highest fungal isolate (33%) while *Epidermophyton floccosum* (12.0%) was the commonest dermatophyte isolated followed by *Microsporum gypseum* and *Trichophyton metangrophytes* (7.7%) each.

Regarding the result of Table 3, present study showed that less than half of the respondents (47.0%) had their bath twice daily, while 52.4% shared their combs with others. Majority of the respondents (51.3%) washed their hair with soap daily. Most of the female respondents had their hair done once in a month (50.0%) while 44.2% of the boys shaved with their personal clipper. About 14% of the respondents played with sand and 42.8% played with domestic pets. Overall about half of the respondents (48.6%) have poor level of hygiene. This study revealed that there was a statistically significant association between social class and presence of *T. capitis* with 13% of pupils from upper social class having *T. capitis* compared to 42% of those from lower social class ( $p < 0.001$ ) and a statistically significantly higher proportion of pupils from public school having *T. capitis* (25.7%) compared to 17.6% of pupils from private school ( $p = 0.04$ ). There was no statistically significant association between sex and presence of *T. capitis* ( $p = 0.34$ ) as shown in Table 4.

According to Table 5 there was a statistically significant relationship between frequency of bath and presence of *T. capitis* with over a third of the respondents (36.8%) who had their bath daily having *T. capitis* compared to 6.7% of their counterpart who had their bath more than once daily ( $p < 0.001$ ). 33% of respondents who shared combs had *T. capitis* compared to 10% of their counterparts who do not share comb ( $p < 0.001$ ). 28% of the respondents who played with domestic animals/pets had *T. capitis* compared to 17% of those who do not ( $p < 0.001$ ) while 92% of those that played with sand had *T. capitis* compared to 10% of those that do not play with sand ( $p < 0.001$ ). There was a statistically significant relationship between upkeep of the hair in both sexes and presence of *T. capitis* ( $p < 0.001$ ). Use of personal clippers was also associated with *T. capitis* with *T. capitis* occurring in 11% of those who use personal clippers compared to 27% of those who do not use ( $p = 0.003$ ).

The principal determinants of *T. capitis* were school type and personal hygiene status. Pupils in a public school were four times more likely to have *T. capitis* than those in private schools. Pupils with good hygiene were four times less likely to have *T. capitis* than those with



**Table 2.** Frequency of culture isolates of *T. capitis* in studied group.

Variable	Frequency	Percentage
<b>Tinea capitis (N=420)</b>		
Present	91	21.7
Absent	329	78.3
<b>Culture isolates (N=91)</b>		
<i>Microsporungypseum</i>	7	7.7
<i>Trichophyton metangrophytes</i>	7	7.7
<i>Epidermophyton floccosum</i>	11	12.0
<i>Aspergillus brasiliensis</i>	30	33.0
No organism isolated	36	39.6

poor personal hygiene (Table 6).

## DISCUSSION

*T. capitis* has been shown to be a major public health challenge in primary school pupils in Nigeria and all over the world and this has again been demonstrated in this study where the prevalence of *T. capitis* among primary school pupils is 21.7%. This was found to be higher when compared to a similar study done in Ile Ife by Ajao et al. (1985) with a prevalence of 14.0%, which might be suggestive of an increase in the prevalence of the disease over the years. It is also higher compared to studies by Emele and Oyeka, (2008) and Enendu and Ibe (2005) in eastern Nigeria who found a prevalence of 9.4% and 13.9% respectively which could probably be due to difference in geographical location for the study. The prevalence of *T. capitis* from our study was found to be lower than that by Akinboro et al. (2011) in a community in Oshogbo among children aged 5 to 16 years with a reported prevalence at 43.5% which may not be unconnected with the fact that their study was done in the community as opposed to school based in our own study.

The present study assessed primary school pupils who were within the age range of 4 to 16 with the most being between 4 and 12 years old which is the age range purported to have the highest prevalence as reported by Akinboro et al. (2011). *T. capitis* is the most common type of dermatophytosis among children and most commonly spread by close contact, especially in schools and households from human carriers, pets and via inanimate objects like combs, clippers and hairdresser equipments (Akinboro et al., 2011; Chepchirchir et al., 2009). There is no demonstrable sex predilection for *T. capitis* in this study which is at variance with other studies (Dogo et al., 2016; David et al., 2010; Emele and Oyeka, (2008); Enendu and Ibe, 2005; Nweze, 2001). Various conflicting views exist regarding the sexual predominance of *T. capitis* which may be attributed to hairdressing and styling practices such as tight hair braiding, shaving of

the scalp, plaiting, and the use of hair oils which may promote disease transmission. However, the precise role of such practices remains a subject for another study.

In this study, majority of respondents from lower social economic class had *T. capitis*. This is in keeping with findings of other studies that revealed the link between lower socio-economic status and prevalence of *T. Capitis* (Ayanlowo et al., 2014; Akinboro et al., 2011; Ajao et al., 1985). The findings in our study might be due to the fact that parents of children from lower socio economic status may not have enough funds to provide personal clippers, individual combs, bedding materials, and toiletries for their children and this can result in easy spread of infection among such children once one of them is infected from school or in the neighbourhood. Such children may also live in slums with poor environmental hygiene and overcrowding which facilitate growth of the organism.

Children from low socio-economic class may not access care on time due to lack of funds or ignorance on the part of their parents. This study showed that there was higher prevalence of *T. capitis* in the public schools compared to the private schools. This was similar to finding from a comparative study of *T. capitis* in children of public and private schools in Rivers state, Nigeria (Wokoma, 2009). This may be due to the fact that children of lower social class are more likely to attend public schools where little or no school fees is paid and lower social socio-economic status have been found to be responsible for higher prevalence of the disease in this study and also buttresses the influence of seasonality and geography on skin diseases.

The predominant fungal isolate in this study was *Aspergillus niger* (33%) which was contrary to the findings of other studies (Akinboro et al., 2011; Enendu and Ibe, 2005; Ayanbimpe et al., 2003; Ajao and Akintunde, 1985) and this could be as a result of climatic influence on aetiology of mycoses. *Epidermophyton floccosum* (12.2%), *M. gypseum* and *T. metangrophytes* (7.7%) were the least isolated organisms. The findings from this study revealed that *T. capitis* was more among those that bath daily compared to those who bath more than once daily. This may be because most houses do not have pipe-borne water therefore some children have to trek some distance to access water, some of whom on their way to get water play with sand, carry buckets on their heads and may have contact with the infectious agents. This lack of easy access to water may reduce frequency of bathing and allow colonization of the skin by the fungi agents following contact with the infectious agents. There was higher prevalence of *T. capitis* in those who had close contact with pets or domestic animal compared to their counterparts in this study. This was similar to findings from a study from Sokoto state of Nigeria where livestock and pet domestication was found as a common practice in households. That study

**Table 3.** Hygiene practices among respondents.

Variable	Frequency (N=420)	Percentage
Frequency of bathing		
Once daily	193	46.1
Twice daily	197	47.0
More than twice daily	30	6.9
Sharing of comb		
Yes	220	52.4
No	200	47.6
Frequency of washing hair with soap (boys) N=240		
Once in a week	34	14.2
Once in two days	21	8.8
Once daily	123	51.3
More than once daily	62	25.7
Frequency of hair-do (for girls) N=180		
Once weekly	45	25.0
Two to three times a month	40	22.2
Once in a month	90	50.0
Once in two months	5	3.8
Play with sand	60	14.4
Play with domestic animals/pets	180	42.8
Shave with personal clipper (boys) N=240	106	44.2
Personal hygiene		
Poor	204	48.6
Average	158	37.6
Good	58	13.8

**Table 4.** Association of *T. capitis* with some socio-demographic characteristics.

Variable	<i>T. capitis</i> present (N=91)	<i>T. capitis</i> absent (N=329)	Statistic
<b>Social class</b>			
Upper	10 (13.1)	66 (86.9)	$\chi^2=55.6$ ; $P<0.001$
Middle	20 (10.0)	180 (90.0)	
Lower	61 (42.4)	83 (57.6)	
<b>Sex</b>			
Male	48 (20.0)	196 (80.0)	$\chi^2=0.92$ ; $P=0.34$
Female	43 (23.9)	137(76.1)	
<b>Type of school</b>			
Public	54 (25.7)	156 (74.3)	$\chi^2=4.05$ ; $P=0.04$
Private	37 (17.6)	173 (82.4)	

established the fact that domestic animals are important reservoir of tinea (Ameh and Okolo, 2004). Other studies have also shown that children having close contact with

animals or pets had *T. capitis* compared to their counterparts who do not (Ayanlowo et al., 2014; Ginter-Hanselmayer et al., 2007).

**Table 5.** *T. capitis* and hygiene practices.

Variable	<i>T. capitis</i> present (N=91)	<i>T. capitis</i> absent (N=329)	Statistic
<b>Frequency of bathing</b>			
Once daily	71 (36.8)	122 (63.2)	$\chi^2=48.19$ ; P< 0.001
Twice daily	18 (10.1)	179 (89.9)	
More than twice daily	2 (6.7)	28 (93.3)	
<b>Sharing of comb</b>			
Yes	72 (32.7)	148 (67.3)	$\chi^2=33.30$ ; P <0.001
No	19 (9.5)	181 (90.5)	
<b>Frequency of washing hair with soap (boys)</b>			
Once a week	23 (67.6)	11 (33.4)	$\chi^2=75.2$ ; P <0.001
Once in two days	10 (47.6)	11 (52.4)	
Daily	8 (6.5)	115 (93.5)	
More than once daily	7 (11.3)	55 (88.7)	
<b>Playing with sand</b>			
Yes	55 (91.7)	5 (8.3)	$\chi^2=188.5$ ; P<0.001
No	36 (10.7)	300 (89.3)	
<b>Playing with domestic animal/pet</b>			
Yes	50 (27.8)	130 (72.2)	$\chi^2=6.93$ ; P =0.01
No	41 (17.1)	199 (82.9)	
<b>Frequency of hair-do (girls)</b>			
Once a week	3 (6.7)	42 (93.3)	$\chi^2=16.24$ ; P =0.001
Twice a month	7 (17.5)	33 (82.5)	
Monthly	30 (33.3)	60 (66.7)	
Every two months	3 (60.0)	2 (40.0)	
<b>Shaving with personal clipper (boys)</b>			
Yes	12 (11.3)	94 (88.7)	$\chi^2=8.94$ ; P =0.003
No	36 (26.9)	98 (73.1)	
<b>Level of personal hygiene</b>			
Good	5 (8.6)	53 (91.4)	$\chi^2=6.77$ ; P =0.03
Average	37 (23.4)	121 (76.6)	
Poor	49 (24.0)	155 (76.0)	

It is culturally believed in this environment that rearing animal can prevent evil from occurring in a household, households also rear animals for sale and personal consumption. Some of these animals harbour fungi infections and children have close contacts with such animals which might explain the reasons for more *T. Capitis* infection among those in close contact with pets and animals compared to those who are not. This study revealed that children with proper upkeep of their hair and those who possess personal clippers had less

prevalence of *T. capitis* compared to their counterparts who do not. This is in line with findings gotten by Akinboro et al. (2011) at Osogbo and David et al. (2010) in Adamawa state that showed that barbing equipment can harbour fungi infections and thereby transmitting it. The findings in this study might be due to the fact that regular hair upkeep and possession of personal clippers and combs reduces exposure to the barbing and hairdresser equipments which may harbor the tinea infection.

**Table 6.** Determinants of *T. capitis*.

Variable	$\beta$	OR	95% CI	P value
School type (Public)	1.51	4.55	2.59-7.98	<0.001
Poor personal hygiene (Ref)	-	-	-	0.03
Fair personal hygiene	-0.99	0.38	0.10-1.37	0.13
Good personal hygiene	-1.49	0.24	0.06-0.82	0.24
Constant	-1.07	0.34	-	0.11

Nagelkerke  $R^2=15\%$ .

Hygiene status of an individual's skin has been cited as one of the risk factors associated with the acquisition of dermatophyte infections. The poorer the hygiene, the higher the chances of acquiring infection. This assertion is corroborated by our study which reported a statistically significant relationship between level of hygiene and presence of *T. capitis*. This finding is in keeping with findings of other previous study in Nigeria and other African countries (Amaran et al, 2011; Ali et al., 2009; Menan et al., 2002).

## Conclusion

Prevalence of *T. capitis* is still high in this environment, personal hygiene and socio-economic status are important predictors of *T. capitis* infection. Thus, more attention needs to be paid to personal hygiene through health promotion and education interventions to reduce the scourge of *T. capitis*.

## CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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*Full Length Research Paper*

# **Seroprevalence of *Chlamydia trachomatis* infection among pregnant women attending antenatal clinics within Kaduna metropolis, North-Central, Nigeria**

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***Chlamydia trachomatis* is a major causative agent of sexually transmitted disease (STD), which can damage a woman's reproductive organs. The prevalence of *Chlamydia trachomatis* infection was investigated among 200 pregnant women attending antenatal clinics in three hospitals located within Kaduna metropolis, North-Central, Nigeria. Enzyme linked immunosorbent assay technique was performed to detect chlamydia antibodies. The overall prevalence of *C. trachomatis* in the population studied was 9.5% (19/200). The highest percentage of prevalence rate, 6.5% (13/200), was seen in women belonging to the age group of 25 or less; this corresponds to women in their late teens and early twenties, and was also the most sexually active age group. Polygamy and low income status were also associated with higher infection rates. The commonest symptom recorded for the respondents that tested positive to Chlamydia infection was found to be vaginal irritation (27.8%), followed by vaginal discharge (25.9%); other symptoms observed were dysuria (14.8%) and lower back pain (9.3%). 18.5% of respondents had a past history of sexually transmitted diseases (STDs). The distribution of women that tested positive for *C. trachomatis* antigen within the hospitals investigated showed that 11%, (11/100) were from Yusuf Dantsoho Memorial Hospital, with a similar number, 11.66% (7/60), from Kawo General Hospital, while Shehu Mohammed Kangiwa Medical Centre was seen to have only 2.5% (1/40) positive cases. *C. trachomatis* infection is largely underdiagnosed in the population, therefore specific preventive and intervention strategies for Chlamydia infection should be developed and targeted among the sexually active general population.**

**Key words:** *Chlamydia trachomatis*, pregnant women, antenatal clinics, seroprevalence, ELISA.

## **INTRODUCTION**

Chlamydia is a common sexually transmitted disease caused by the bacterium *Chlamydia trachomatis*, which

can damage a woman's reproductive organs such as the uterus (womb), fallopian tube, ovaries etc. The scarring

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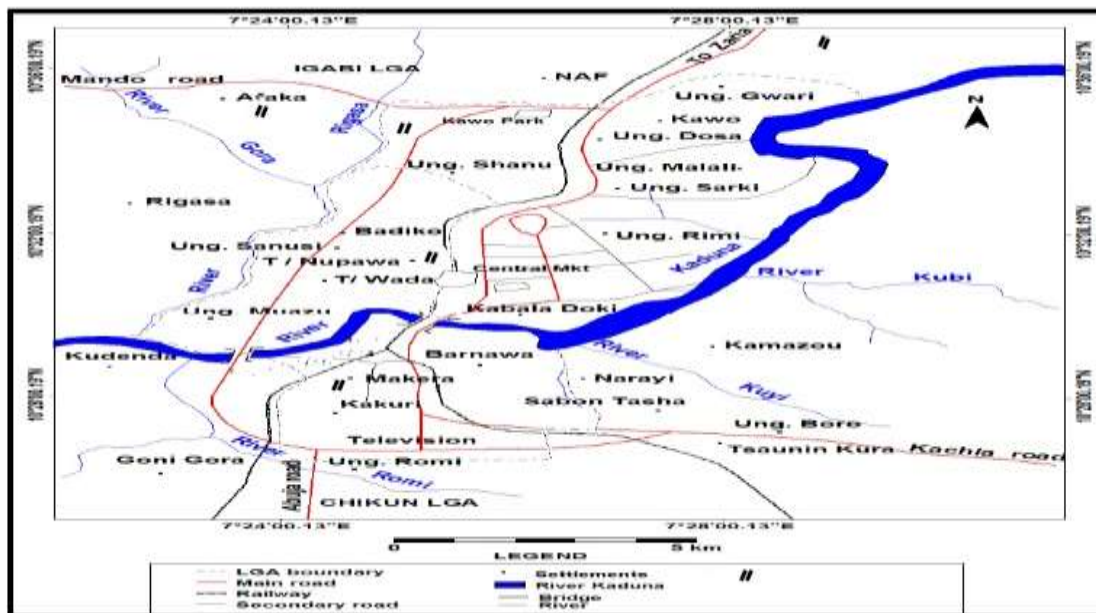


Figure 1. Sketch map of Kaduna municipal area showing the study sites.

that results on these organs can lead to infertility, tubal (ectopic) pregnancy, chronic pelvic pain, abscesses (sores containing pus) and other serious problems (Paavonen and Eggert-Kruse 1999). Chlamydia is transmitted through sexual contact with the penis, vagina, mouth, or anus of an infected partner. Ejaculation does not have to occur for chlamydia to be transmitted or acquired.

Perinatal infections also occur; as many as half of all infants born to mothers with chlamydia will be born with the disease (Chojnacka et al., 2012). Chlamydia can affect infants causing spontaneous abortion, premature birth, conjunctivitis, which may lead to blindness, and pneumonia (Cates et al., 1990). In fact, *C. trachomatis* is the most common cause of neonatal conjunctivitis and is one of the most common causes of pneumonia during the first few months of live. Infants with Chlamydia pneumonia are at increased risk of abnormal pulmonary function tests later in childhood (Harrison et al., 1983; Taffa, 2002). Pregnant women can be more susceptible to chlamydial infection, due to changed pH of the vaginal region, and depressed immunity (Satyajit et al., 2005).

Sexually active young people are at high risk of acquiring chlamydia, due to a combination of behavioral, biological, and cultural reasons (Eaton et al., 2012).

Chlamydial infections are usually asymptomatic, and in many developed countries, screening programmes for Chlamydia have been set up to reduce transmission and reproductive tract morbidity (ECDC, 2009). Currently, chlamydia screening for sexually active women aged <25 years is recommended by the U.S. Preventive Services

Task Force (Torrone, 2012).

This study was conducted to estimate the seroprevalence of *C. trachomatis* infection among pregnant women attending antenatal clinics in Kaduna metropolis, North Central Nigeria, and to assess some of the risk factors associated with the disease.

## MATERIALS AND METHODS

The study was carried out at Kaduna Polytechnic Medical Centre, Tudun Wada, Yusuf Dantsoho Memorial hospital, and Kawo General Hospital Kaduna within the months of July-September, 2017. The hospitals provide health care for lower- middle class and lower income population within and around the geographical location as shown in Figure 1.

Ethical approval was obtained from the hospitals. All pregnant women attending the hospitals antenatal clinics during the period of the study were involved in the study. Individual consent was sought and patient confidentiality was ensured. Clinical variables including symptoms were obtained via questionnaire.

Blood samples were taken using sterile disposable syringes from all the women who attended the ante natal clinics. The blood samples were allowed to clot and centrifuged at 3,000 rpm. The sera were then separated into plain bottles and preserved at 2-8°C.

The qualitative immunoenzymatic determination of IgG - class antibodies against *C. trachomatis* is based on the Enzyme linked immunosorbent assay technique (ELISA). *C. trachomatis* antibody was determined using *C. trachomatis* IgG ELISA, Trinity kits, Cat No 2346200, USA. Microtiter strips wells were precoated with *C. trachomatis* antigen to bind corresponding antibodies of the specimen. After washing the wells to remove the unbound sample material, horseradish peroxidase (HRP) labelled anti-human IgG conjugate was added. This conjugate bound to the captured

**Table 1.** Distribution of study group according to socio-demographic characteristics.

Variables	Frequency	Percent %
<b>Ages</b>		
≤ 25	134	67
26-35	57	28.5
36-45	9	4.5
<b>Income (month)</b>		
< 20,000 (low)	90	45.0
20,000-50,000 (middle)	69	34.5
> 50,000 (high)	41	20.5
<b>Educational Qualification</b>		
Informal/Primary	127	60.5
Secondary	54	29.5
Tertiary	19	10
<b>Marriage type</b>		
Polygamous	137	68.0
Monogamous	63	32.0

Chlamydia specific antibodies. The immune complex formed by the bound conjugate was visualized by adding tetramethylbenzidine (TMB) substrate, which produces a blue reaction product. The intensity of this product is proportional to the amount of Chlamydia-specific IgG antibodies in the specimen. Sulphuric acid was added to stop the reaction. Absorbance at 450 nm was read using an ELISA micro well plate reader.

#### Statistical analysis

Pearson's Chi-square test was used to test for the association between *C. trachomatis* infection and age groups of subjects, level of education, income, marriage type. Probability (p) values were considered as follows: If P value < 0.05 = there is statistically significant association between the two variables.

## RESULTS

Two hundred and five questionnaires were administered to respondents, and 200 were returned. This indicated a 97% response rate which is considered an excellent response rate and sufficiently representative for the analysis. The data obtained showed there were no single mothers among the respondents as all indicated they were married.

The data in Table 1 shows that the majority of the pregnant women within study group were in the age group of ≤ 25, fell within the low income bracket, had primary school qualification or no formal education.

Table 2 shows that 9.5% (19/200) of the pregnant women tested positive to chlamydia infection using

serological approach, while 91.5% (181/200) of the women tested negative in the distribution.

Figure 2 connotes that 25.9% of the respondents had vaginal discharge, 27.8% of the respondents had vaginal irritation, 14.8% of the respondents had dysuria, while only 9.3% had lower back pain, 3.7% had fever and 18.5% of the respondents had a past history of STD.

From the socio-demographic correlation carried out, it was found out that there was significant association between the socio-demographic factors such as age, level of income, educational qualification and marriage type and chlamydia infection, with probability values for each less than 0.05 (P<0.05), against the non-significant p values of P>0.05.

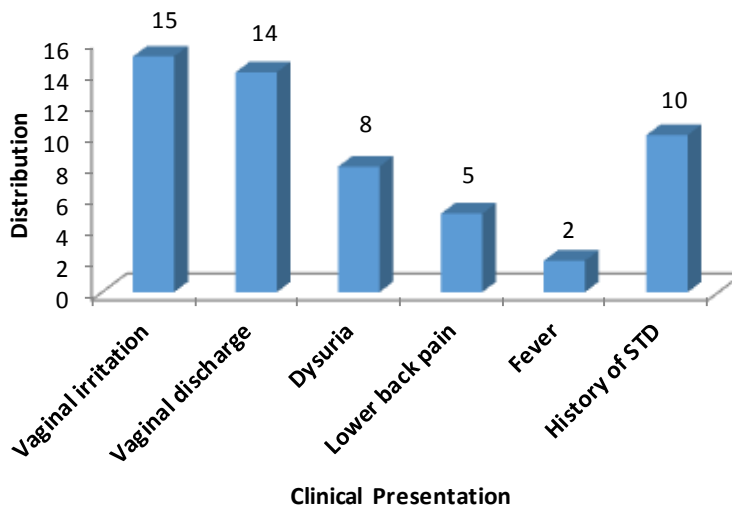
## DISCUSSION

The prevalence rate of Chlamydia infection reported in this study was 9.5% using the serological approach; this falls between rates reported by other studies in similar subjects and settings (2.5% and 36%) (Taffa et al., 2002); and significantly lower than the 57.5% prevalence in pregnant women reported by Mohammed et al., (2016).

The number of previous studies conducted in Nigeria is limited: in a study in Benin, Nigeria, prevalence rate of chlamydia infection in pregnant women was 13.3%, (Isibor et al., 2005) which is higher than the findings in this study; another from infertility and STI clinics showed 9.6% (Nwankwo and Magaji, 2012); and 57.5% was found

**Table 2.** Association of socio demographic correlation with chlamydia infection.

Parameter	Serology positive (%)	Serology Negative (%)	Chi-square	P-value
<b>Women's age</b>				
≤ 25	13(112)	187(25)	9.342	0.009
26 – 35	4(82)	196(50)		
36 – 45	2(61)	198(25)		
<b>Income /month</b>				
< 20,000 (low)	15(67)	185(25)	7.342	0.005
20,000 – 50,000	3(16)	197(25)		
> 50,000 (high)	1(16)	199(50)		
<b>Educational Qualification</b>				
Informal/primary	13(50)	187(50)	4.342	0.006
Secondary	3(16)	197(25)		
Tertiary(Dip/degree)	3(34)	197(25)		
<b>Marriage type</b>				
Monogamous	5(34)	195(75)	8.442	0.010
Polygamous	14(66)	186(25)		



**Figure 2.** Distribution of clinical presentation among pregnant women attending antenatal clinics that tested positive for Chlamydia.

in pregnant women in North–Central States (Mohammed et al., 2016). Other reports from STI clinics also showed variable prevalence (Van Duynhoven et al., 1997).

In contrast to these high prevalence rates in African countries, the prevalence of chlamydia among persons aged 14–39 years in the United States was 1.7% (Torrone et al., 2012) while the global prevalence estimate of chlamydia among women aged 15-49 years was 4.2% (Newman et al., 2012)

It is worth mentioning that the incidence of Chlamydia infection in developing countries is difficult to establish due to many factors. There is a socio cultural inhibition that prevents women from reporting sexual symptoms, non-availability of facilities to detect the organism in many health clinics, the asymptomatic nature of the disease and variation in the sensitivities and specificities of the various diagnostic kits used (Okonofua et al., 1995; Harry et al., 1994; Nwankwo and Magaji, 2012).



In an attempt to identify high risk factors among women attending the clinics and the predisposing factors associated with the disease, several determinants were studied. It was found that age, economic status, educational qualification and marriage type were significantly associated with positive chlamydia infection.

The significant association between positive chlamydia infection and low income/level of education found in this study could be attributed to poor health literacy and inability to access care or screening because of financial constraints. Because of socio economic reasons, women attending antenatal clinics might not have previously consulted a doctor for chlamydia, and might be seeking treatment for the first time at those clinics for health problems. The significant association of income and education with positive chlamydia infection is consistent with some studies (Behrozi et al., 1999). The high prevalence observed for young adults ( $\leq 25$  years) could be attributed to the increased risk for infection because of biologic risk factors (for example cervical ectopy might predispose to infection and is more common in younger women) (Kleppa et al., 2015), other factor could be sexual behavior as these are the most sexually active age group. The significant association between young age (<25 years) and chlamydia infection is in agreement with others studies (Kissin et al., 2002; Alarape et al., 2008).

A decreased susceptibility to infection with increasing age has been attributed to epithelial changes, which may result in a decreased rate of infection in the elderly (Latino et al., 2002). Partial immunity can also prevent reinfection in the elderly (Bachman et al., 2003). The effect of age may also be attributed to non-measured sexual characteristics such as frequency of sexual intercourse per partner and the duration of intercourse (Van Duynhoven et al., 1997).

Based on the analysis, it was shown that some respondents that were asymptomatic tested positive to *C. trachomatis* antibodies. This finding agrees with the results of other researchers (Sturm-Ramirez et al., 2002).

Regarding sexual behaviour, not surprisingly, most women provided no answers to most of the questions like condom use, extra marital sex. This is probably due to strong religious beliefs in the community about extra marital sex. Obtaining information on such issues is almost impossible in our community because such activities are often illegal, and lack of such data is a limitation of this study, especially when trying to determine an association between sexual activity and chlamydia infection.

## Conclusion

Chlamydia infection seems wide spread among the sexually active general population of our country (Nigeria).

It is therefore imperative that a concerted effort should be put in place to ensure that chlamydia investigation is made part of routine screening among young teens and pregnant women, to avoid any post abortal complication, infertility and mother to child transmission.

## CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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*Full Length Research Paper*

# **Assessment of major causes of heart failure and its pharmacologic management among patients at Felege Hiwot referral hospital in Bahir Dar, Ethiopia**

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Heart failure is a complex, clinical syndrome of signs and symptoms that are caused by defects in cardiac structure, function, or both, resulting in impairment of peripheral circulation and organ oxygenation. It is a staggering clinical and public health problem and the study of the epidemiology on heart failure demonstrated that heart failure is associated with significant mortality, morbidity, and health care expenditures. It is a disorder in which the heart pumps blood inadequately which lead to reduced blood flow, congestion of blood in the veins and lungs, and other changes that may further weaken the heart. The aim of this study is to assess the relative contribution of the various causes of heart failure and its prevalence over time which helps policy makers as a tool for decision making in allocating resources and to analysis the association of heart failure with related factors. To a chive this objective of the study a retrospective cohort study based on data from the heart failure patients at Felege Hiwot referral hospital from 2013 to 2017. The analysis revealed that the prevalence of heart failure was decreased over time when we compared patient who had taken treatment with patients who does not take any treatment. Hypertension, diabetes mellitus, anemia, and infection were highly correlated with heart failure and had significant effect on heart failure ( $p < 0.05$ ) and treatments are the basic way to manage heart failure and to recover from this disease. About 71% of patients who died from heart failure were died within four years of diagnosis.

**Key words:** Assessment, heart failure, management and pharmacologic.

## **INTRODUCTION**

Heart failure (HF) is a complex, clinical syndrome of signs and symptoms that are caused by defects in cardiac structure, function, or both, resulting in impairment of peripheral circulation and organ oxygenation in which

more than 6 million people in the United States older than 20 years have heart failure, approximately 800,000 new cases are diagnosed each year (Katz, 2013). Heart failure is a major public health problem associated with

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high morbidity and mortality among individuals 65 years and older (Sochalski et al., 2009). It is the most common principal discharge diagnosis among medicare beneficiaries and the third highest for hospital reimbursements (Home Health Agency center, 2017). This disease is the leading causes of death in all developing regions of the world with the exception of sub-Saharan Africa, where the first phase of the epidemiologic transition is still dominant, although with a shifting trend towards a double burden of infectious and non-communicable diseases (Boutayeb, 2006). Epidemiological studies and data from clinical trials have shown that the early time period after a hospitalization for HF is a particularly vulnerable interval. Although survival rates for all patients with HF have improved during the past several decades, the greatest gains have been made in the treatment of patients with heart failure with reduced heart failure (Gurwitz et al., 2013).

Evidence from clinical trials supports the use of digoxin to improve symptoms and reduce hospitalization in patients with HF with reduced left ventricular ejection fraction particularly in patients with more advanced symptoms that contributes to digoxin's as well as neurohumoral and it acts by inhibiting the Na-K-ATPase pump, thus reducing the transport of sodium from the intracellular space in myocytes (Ambrosy et al., 2014). An observational study, including propensity analysis (Cleland, 2013), report that aspirin 75 mg/d, given to 828 outpatients with chronic heart failure, was associated with a 30% reduction in hospitalizations for heart failure and a 42% reduction in mortality compared either with 503 patients not taking aspirin or 64 patients taking higher doses of aspirin.

Based on a research done on the prevalence and etiology of heart failure in patients seen at a teaching hospital in Ghana, the result shows that among the 524 patients involved in the study, 398 of the patients had heart failure according to the modified framingham criteria for the diagnosis of heart failure; giving rise to a prevalence of 76%. Duration of heart failure symptoms is an important factor affecting survival in patients who receive mechanical circulatory support. Patients with heart failure who received mechanical circulatory support have an overall better survival and higher frequency of transplantation and myocardial recovery, despite being sicker at the time of implantation.

In developing countries including Ethiopia, there are many unsettled issues and even controversies among physicians regarding the pharmacologic preferences, indications and contra indications to start a drug and when to hold. In the study done by Belete and Fessahaye (2010) in Jimma University specialized hospital during a five year period, they found that among 781 cardiac cases, Rheumatic heart disease was more common 256 (32.8%) followed by hypertensive heart disease and cardiomyopathy accounting for 189 (24.2%)

and 158 (20.2%) of cases, respectively. There were no study done on incidence or prevalence of heart failure in the adult population in Ethiopia. However, there are indicators that heart failure will be a significant burden in the country, and typically affects middle-aged adults. The aim of this study is to assess the relative contribution of the various causes of heart failure and its prevalence over time which help policy makers as a tool for decision making in allocating resources. Additionally it can be used as a baseline data for community based epidemiological studies to see burden of heart failure diseases in the public setting and to identify the significant factors which causes heart failure.

## MATERIALS AND METHODS

### Study design and eligibility for the study

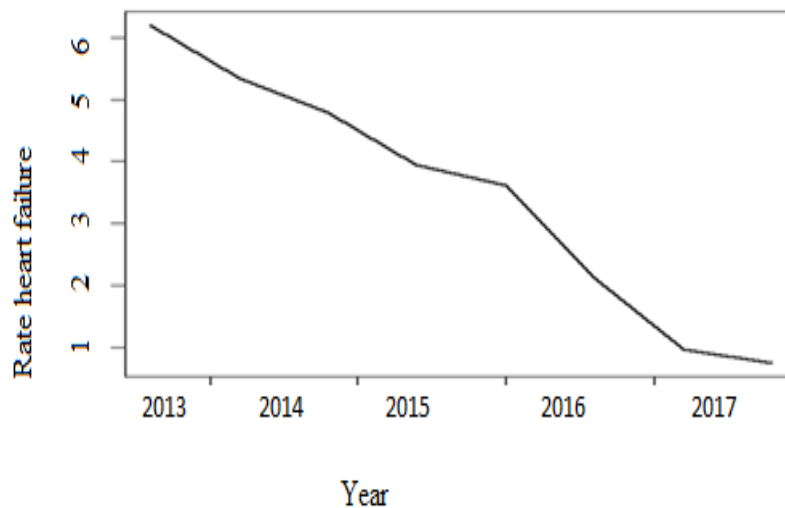
A retrospective record review was conducted to collect data registered from September, 2013 to August, 2017. The target populations of this study are all heart failure patients who attend Felege Hiwot referral hospital and have been active in follow-up for their Heart failure. During the 4 year period from September 2013 to August 2017, a total of 1681 cardiac patients were admitted, 936 patients to the medical ward and 745 patients to intensive care units (ICU). Among these 384 cases that had follow up and newly diagnose patients who were enrolled to the follow up and had complete card record were taken as study subjects. And hence, 384 patients were considered to collect the data of heart failure which was evaluated at fixed time points. During the data collection time each incomplete chart of the patient was excluded to overcome the problem of data missing, even though there were missing handling mechanisms.

One aim is to ensure horizontal equity in the analyses and comparison on the effect of factor affecting heart failure. The relevant inpatient data were extracted with the study variables on sex, age, precipitating factor, duration of illness, method of diagnosis, associated factors, drug combination, cause of congestive heart failure, frequency of emergency visit, frequency of hospitalization, Spironolactone, digoxin, aspirin, final assessment, New York heart classification and Simva or atrovastatin. Previous studies have reported a proportion among patients with heart failure widely varying from 13 to 74% (Vasan et al., 1995). The different study populations and differences in study design and diagnostic criteria used for heart failure in general are probably responsible for these discordant epidemiological data (McAlister et al., 1999). A recent retrospective community study conducted in patients hospitalized for heart failure over a period of 15 years showed a decrease over time in the average prevalence of heart failure after they starts the treatment as compared with heart failure who had not start their drugs which could be one explanation for the variable proportion of patients with heart failure in various studies. Studies including younger patients show a lower frequency of heart failure (Cohn and Johnson, 1990). Multivariable analysis identified older age, stroke, diabetes, cancer, hyponatraemia, and low glomerular filtration rate as predictors of 5 year mortality in heart failure. In a recent study including hospitalized patients with newonset heart failure, 1 year predictors of mortality in patients with preserved heart failure were age, systolic blood pressure, hyponatraemia, anemia, renal dysfunction, and co-morbidities (Owan et al., 2006). An exploratory analysis was conducted to obtain descriptive statistics of the study variables to obtain percentages and to analyses the

**Table 1.** Covariates used in the assessment of heart failure data.

Variable	Categories (Descriptions)
Sex	Female, Male
Age	Year
Education status	Literate, Illiterate
Precipitant factors	Infection, Arrhythmia, Anemia, MI and Drug discontinuation
Duration of illness	newly diagnosed, less than 1, 1-5 and more than 5 years
Method of diagnosis	Clinical + CXR, ECG, ECHO
NYHA classification	NYHA class ii, NYHA class iii and NYHA class iv
Cause of CHF	CRVHA, Cardiomyopathy, IHD, HHD, Corpulmonale, Anemia
Time of emergency visit	None, Once, Twice, 3 times and more than 4 times per year
Time of hospitalization	None, Once, twice, 3 times and more than 4 times per year
Aspirin	Yes and No
Simva/Atorvastatin	Yes and No
Spironolactone	Yes and No
Digoxin	Yes and No
Associated factors	Hypertension, CKD, DM, RVI and thyroid disorders

NYHA = New York Heart Association, ECG = Electrocardiogram, DM=Diabetes mellitus, CKD = Chronic Kidney disease, HHD= Hypertensive heart disease, IHD = Ischemic heart disease, MI = myocardial infarction, CXR = Chest x-ray, CRVHD = Chronic rheumatic valvular Heart disease, CHF= congestive heart failure, RVI = Respiratory viral infections ECHO = Echocardiogram.

**Figure 1.** Progression of heart rate over time.

relationship between the degree of heart failure and the health failure related factors, a univariate analysis was performed using the chi-square test. Continuous variables were expressed as mean  $\pm$  standard deviation while the categorical variables were summarized by per cents and analyzed with Chi-square test. Associations of heart failure with age, sex and others factors were sought using chi-square. P value  $\leq 0.05$  was considered statistically significant. In this study several potential explanatory variables were considered in this study (Table 1).

## RESULTS AND DISCUSSION

In this study 384 patients were considered to collect the heart failure which was evaluated at fixed time points. Based on graph of Figure 1, this study had shown that after the patient starts their medication, the rate of heart failure was changed over time. The notion is that because heart rates may increase or decrease over time

**Table 2.** Univariate analysis of predictors in patients with heart failure.

<b>Variable</b>	<b>% (n)</b>	<b>P-Value</b>
Age	48.36±19.043	0.0001
Sex (Female)	53.6(206)	0.002
Education (Illiterate)	271(70.6%)	0.0021
<b>NYHA Class</b>		<b>0.008</b>
NYHA class ij	6(23)	
NYHA class iiii	11.5(44)	
NYHA class iv	27.3(105)	
<b>Percipient factors</b>		<b>0.004</b>
Infection	27.3(105)	
Arrhythmia	18.8(72)	
Anemia	15.9(61)	
MI	10.4(40)	
Drug discontinuation	9.1(35)	
<b>Method of diagnosis</b>		<b>0.031</b>
Clinical + CXR	26.8(103)	
ECG	7(27)	
ECHO	66.1(254)	
<b>Cause CHF</b>		<b>0.0001</b>
HHD	9.6(37)	
Corpulmonale	7.3(28)	
Anemia	9.6(37)	
Other	2.3(9)	
<b>Duration of illness</b>		<b>0.006</b>
Newly diagnosed	22.8(88)	
< 1 year	38.3(147)	
1– 5 years	32.6(125)	
>5 years	6.3 (24)	
<b>Drugs</b>		<b>0.0041</b>
Aspirin (yes)	6.2 (24)	
Digoxin (yes)	33.9 (130)	
Spironolactone	68 (261)	
Simva/Atorvastatin	59.4 (228)	
<b>Associated factors</b>		<b>0.0071</b>
Hypertension	38.8 (149)	
CKD	6.8 (26)	
DM	20.3 (78)	
RVI	2.1 (8)	
Thyroid disorders	2.1 (8)	
Other	7.03 (27)	

in response to changes in a person's condition or response to a treatment. From the graph we understand that, when the patients start their follow up like taking of treatments (aspirin, digoxin, Spironolactone) the prevalence of heart failure was decreased over time as

compared to the patient who does not take any treatment.

Based on the result of Table 2, the demographic characteristics result, states that the mean age was 48.36 years with a standard deviation of ±19. 043 which shows

that heart failure was affect the middle age group as well as the older age group and age had a significant effect on heart failure ( $p = 0.0001$ ). This result also has similarity with the study of Hunt (2005) who conclude that the overall prevalence of heart failure in the adult population in developed countries is 2% and its prevalence increases with age. Among the total study subjects 53.6% (206 cases) were females that indicates females were more exposed for heart failure than males, sex was also one significant factor for the cases of heart failure ( $p=0.002$ ) which is in line with the study result of Isaac and Yaw (2013) and the study by Scantlebury and Borlaug (2011), which states the etiology of heart failure has been shown to have significant differences by sex.

Similarly, on the result of education status most of the patients were, 271(70.6%) were illiterate ( $p=0.0021$ ). This result is an indicator about the inverse relationship between education and management of heart failure disease for an individual which is similar to the study of Harper et al. (2011) were conclude developed nations, education has been shown to be inversely associated with coronary heart disease. This relation has great importance to many health professionals and policy makers (Commision on Social Determinants of Health, 2008).

Different associated factors had a significant effect on heart failure ( $p = 0.0071$ ). Among those factors hypertension was a cause in 149 (38.8%) of the patients, 26 (6.8%) patients had chronic kidney disease, 78(20.3%) patients had diabetes mellitus (DM), 8 (2.1%) patients had retroviral infection and another 8 (2.1%) had thyroid disorder as a comorbidity. 27 (7.03%) patients had other associated factors like smoking, family history and obesity while the remaining 88 (22.9%) of patients had no documented associated factor which share similar findings with the study of Owan et al. (2006). From this result, hypertension and diabetes mellitus were contributing the highest percentage for cause of the heart disease. When we consider the variable of NYHA class had its own effect on heart failure ( $p=0.008$ ). Based on the NYHA class, 317 (82.6%) of patients had NYHA class *iv*, 44 (11.5%) had NYHA class *iii* and 23 (6%) of the cases had NYHA class *ii*, this reflects NYHA class *iv* takes the highest portion for the cause of heart failure as compared to the other NYHA class. This result is different from Ahmed et al. (2006), however, because the NYHA classification involves doctors' subjective judgment of symptoms and clinical data, wide interobserver variability has been reported. Once the patients went to medication they had diagnosed in different mechanisms, since method of diagnosis had an effect on the type of treatment they had taken ( $p = 0.031$ ). According to this study result about 254(66.1%) of the study subjects were diagnoses in Echocardiogram (ECHO) method and 103(28.6%), 27(7%) were diagnoses by Clinical + CXR and ECG respectively.

After identifying patients that has heart failure, appropriate drug were given for each patients which were the more significant factor in the management of heart failure ( $p= 0.0041$ ). Among those patients, 261(68%) used spironolactone, 228 (59.4%) used simva/atorvastatin and 130(33.9%), 24(6.2%) used digoxin and aspirin respectively. From our observe spironolactone takes the highest percentage for controlling heart failure disease. This is because spironolactone used to treat heart failure by reduces blood pressure, also prevent body from absorbing too much salt which had effect on heart failure. Similarity, simva/atorvastatin helps to control associated factors like DM, hypertension even if aspirin contribute the smallest portion, it is used to lower risk of heart failure in patients with coronary artery disease such as patients with history of heart attack. Drugs reduced heart failure hospitalizations and the combined events of heart failure death or heart failure hospitalization in patients.

In the same case 105 (27.3%) of cases with CHF were precipitated by infection and pneumonia which was the commonest infection accounting for 45 cases (42%) of all infections, arrhythmia was found to be the precipitant in 72 (18.8%) of cases, 61 (15.9%) had anemia as a precipitating factor and 40 (10.4%) had myocardial infarction which was highly related with heart failure and 35(9.1%) of patients had drug discontinuation as a precipitant. And based on duration of illness about 88 (22.9%) of cases were newly diagnosed patient, 147 (38.3%) were diagnosed on follow up for less than 1 year, 125 (32.6%) of cases had follow up between 1- 5 years and 24 (6.3%) were on follow up for > 5 years.

## Conclusion

Heart failure (HF) is an increasingly common problem and is associated with high morbidity and mortality. The associated factors were the most and common causes for heart failure ( $p<0.05$ ). Anemia is concomitant factor and a significant cause of heart failure which shows that risk factors of anemia especially infection like malaria and hookworm infestations are very common in this catchment areas of the study and this is a readily preventable cause by taking preventive measures. Treatments (drugs) are the basic way to manage heart failure and to recover from this disease ( $p= 0.0041$ ). About 71% of patients who died from heart failure were dead within four years of diagnosis, and all the patients who died from heart failure were New York heart association class IV patients which shows the functional status is an important predictor of outcome.

## CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

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*Full Length Research Paper*

# Quality of tuberculosis treatment services in public hospitals of Sidama Zone, Southern Ethiopia, 2016

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Tuberculosis (TB) remains a major global health problem, responsible for ill health among millions of people each year. It is the second leading cause of death from an infectious disease worldwide following human immunodeficiency virus (HIV). Tuberculosis control measures are limited by the quality of care provided at the local level. Providing a quality and timely care for patients with TB is crucial in prevention and control of the disease. This study was conducted to assess the quality of TB treatment services in public hospitals of Sidama zone, Southern Ethiopia, 2016. Cross-sectional study was undertaken from 20th May to 30th June, 2016. A total of 251 patients on TB treatment services from six public hospitals were included in the study by using consecutive sampling technique. Data was checked, coded and entered into Epidata version 3.1 and exported to SPSS version 20. Percentages mean score was used to describe overall satisfaction of patients with TB treatment services. Factors predicting patient satisfaction were identified by using multiple linear regression analysis at p-value less than 0.05. Six public hospitals and 13 TB care providers were included in the study. The index of overall structural quality mean score was 0.85 which was graded as good. A total of 48 sessions of patient-provider interaction were observed. From which 33 (68.8%) and 35 (72.9%) patients had greeted in a friendly/polite manner and had participated in decision making process, respectively. The average level of patient satisfaction score with TB treatment services was 71.6%. Educational status, ethnicity and duration of TB treatment appeared to be statistically associated with average patient satisfaction score. Most of the minimum required resources to conduct the service were available in the hospitals. Majority of the studied hospitals are structurally good. Educational status and duration of TB treatment were found to be independent predictors of patient satisfaction. Regular supervision, refreshment training, attentions to patients' dissatisfaction area were forwarded.

**Key words:** Quality of care, structural quality, processes of service provision, satisfaction of patient, Sidama zone.

## INTRODUCTION

Tuberculosis (TB) is a chronic infectious disease caused by *Mycobacterium tuberculosis* an acid-fast bacillus. The main source of infection is untreated smear-positive pulmonary TB patient discharging the bacilli. It is mainly

spread by airborne route when the infectious patient expels droplets containing the bacilli. It is also transmitted by consumption of raw milk containing *Mycobacterium bovis* (Federal Ministry of Health, 2013).

Quality health care is easily defined as doing the right thing (getting the health care services you need), at the right time (when you need it), in the right way (using the appropriate test or procedure), to achieve the best possible results (TriStar Horizon medical center, 2010). Also, Institute of Medicine (IOM) defined health care quality as safe, effective, patient-centered, timely, efficient and equitable (RIEDER, 2002).

Quality of care is a multi-faceted phenomenon. Improving health care quality requires more than the clinical competence of health care providers; it requires more than the availability of supplies and drugs (USAID/PHCR, 2003; Foot and Raleigh 2008). In a service industry, like healthcare, experience of the patient plays a crucial role in rating and assessment of quality of services. Quality in healthcare may comprise of newer technology, newer and effective medication, and higher staff to patient ratios, affordability, efficiency and effectiveness of service delivery (Tam, 2005).

Quality of TB care can be viewed from the patient, the service provider, or the facility management perspectives. When quality is seen from the perspective of a patient coming to the clinic with TB the patient expects to be greeted and treated with respect by a knowledgeable staff and the patient expects to be diagnosed and treated correctly. However, from the perspective of a service provider in that clinic, quality may mean: the provider is competent and confident to be able to provide TB services to the client treatment. And also from the perspective of the health facility management, quality may mean: the health facility is offering services and patients are being seen at the facility; the community is satisfied with the services; there are few complains about the facility from the community (TB care III, 2011).

The quality of health care is one of the agenda in most health care systems. Much of this interest in quality of care has been developed in response to recent dramatic transformations of health care systems, accompanied by new organizational structures and that may affect quality of care. It is also an issue addressed as a component of the Ethiopia Health Sector Transformation Plan (HSTP) and Ethiopia National Health Care Quality Strategy Plan. Successful tuberculosis treatment depends on more than chemotherapy and requires specific clinical and social frameworks based on an individual patient's circumstances (Mainz, 2003; The Federal Democratic Republic of Ethiopia Ministry of Health, 2015).

TB is among the most lethal infectious diseases in the world; killing one person every 3 min. TB disproportionately affects the poor, who are unlikely to have adequate nutrition and access to health care. It is

also a danger to people with compromised immune systems due to human immunodeficiency virus (HIV), diabetes, or other conditions (Heidi et al., 2000).

According to global tuberculosis report, in 2014, there were an estimated 9.6 million new TB cases: 5.4 million among men, 3.2 million among women and 1.0 million among children. There were also 1.5 million TB deaths. About 26% of the incident TB cases occurred in Africa in 2010 (World Health Organization 2015). The proportion of TB cases co-infected with HIV is the highest in countries in the African region. Also, TB is a major cause of morbidity and mortality in Ethiopia. Ethiopia is among the 22 high TB burden countries and among the 27 high multidrug-resistant (MDR) TB burden countries in the world (Federal democratic republic ministry of health, April 2012).

The impact of the disease on individuals and families is often economically devastating. An average TB patient can lose up to 4 months of work and 30% of their annual income. The toll of TB on the global economy is estimated at \$12 billion per year. According to World Bank analyses, countries most affected by TB lose 4 to 7% of gross domestic product due to TB-related decreases in productivity (Ending Extreme Poverty by 2030 (2015), USAID; World bank, 2002).

In recent years, many countries national health programs have expanded their focus to include not only improving access to care, but also improving the quality of care received by patients and communities. As part of quality assurance for many clinical diseases, including TB, international and national evidence-based standards and guidelines have been developed. Having explicit standards and guidelines helps ensure high-quality care, better health outcomes, and cost effective treatments (USAID TB CARE II, 2015).

Complete and effective treatment of every patient with TB disease is essential. In many countries, the standard of care for TB disease is to use directly-observed therapy to ensure that the treatment is effective and that no drug doses are missed. Failure to cure a person with TB disease harms the patient but also exposes the patient's family, co-workers, and community to TB (Ending Extreme Poverty by 2030(2015), USAID).

TB control measures are limited by the quality of care provided at the local level; care such as proper case detection and treatment of infectious cases. There was poor linkage between the TB clinic and the Infectious Disease Clinic (IDC) that provide chronic care services to HIV-positive clients. Additional patient information systems also lacked contact information for supporting proactive client follow-up, the clinic had no mechanisms

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in place for tracking clients who failed to return for routine clinical review, and limited to drug supply and occasional supportive supervision TB CARE 2014; Borgdorff and Broekmans, 2002; USAID, 2012).

According to studies done in Bangladesh and Swaziland on frequencies and causes of delay of TB treatment service revealed that the complex relationship between the patient and health care workers is an important determinant of the outcome of TB treatment. Positive relationship or interaction will lead to good outcome of treatment and vice versa. The success of the interaction is affected by the knowledge of the healthcare workers on the disease and treatment protocol, their skills on patients counseling and education and their attitude towards the patients. Patients who are poorly counseled or educated on TB and its treatment may end up with poor outcomes; similarly, a negative attitude of the health care workers towards the patients will cause them to stop the treatment (TB CARE II, <http://tbcare2.org/content/reducing-tb-delays-evaluating-frequency-and-causes-delays-bangladesh-and-swaziland-0>).

The study done on quality of tuberculosis care and its association with patient adherence to treatment in eight Ethiopian districts revealed that the overall treatment completion rate was 74% while default and death rates were 22 and 3.8%, respectively (Mengiste, 2009). Also, study conducted on patient satisfaction on tuberculosis treatment service and adherence to treatment in public health centers and hospital of Sidama zone showed that the proportion of good adherence patients was 74% and the proportion of poor adherence patients was 26% and poor adherence due to absence of drug was 58.97%, the health facility is far away from home was 8.5%, too hard to take so many pills was 8(6.8%), fear of interaction with other medication was 5.1%, and had other appointment was 5.1% (Zekariyas et al., 2013).

Quality assessment has been considered as one element of quality assurance which looks for sources of problems in a structure, process and outcome of given service. This was the first model developed by Avedis Donabedian to evaluate health care quality. As per the Donabedian's definition of quality, the ultimate goal of quality assessment in health care program is to assess whether a program possesses the right things (input), is doing the right things (processes) and it leads to the right things (outcome) to happen (Counte, 2007). Assessing the quality of care on TB treatment can have significant importance in evaluating TB control activities and in identifying area of improvements of directly observed treatment short course (DOTs) strategies. However, there are limited published studies on the quality of TB treatment services' provision in Ethiopia, and even fewer studies do examine quality of TB treatment services in Sidama Zone. Therefore, this study has investigated the quality of TB treatment services' provision in public

hospitals of the study area. It provides valuable information for those working on TB control activities, researchers and policy makers. This study can also identify major constraints in the quality of TB treatment service.

## MATERIALS AND METHODS

### Study design

Cross-sectional study was conducted in selected public hospitals of Sidama zone from 20th May to 30th June, 2016. The study was conducted in Sidama zone administration which is located at 275 km from the Addis Ababa. Sidama zone has an area of 10,000 km<sup>2</sup> of which 97.71% is land and 2.29% is covered by water. According to Sidama Zone Finance and Economic Department 2015 report, it had a total population of 4,100,000 (2,091,000 male and 2,009,000 Female). Michael (2007) Sidama zone has a population density of 451.83. It consists of 19 Woredas and 4 city administration. Regarding infrastructure, there are 133 health centers, 9 primary hospitals and 1 general hospital in the zone. Currently, all public health facilities including health posts provide TB treatment services.

### Population

The source population include all public hospitals providing TB treatment services in study period, all TB patients who were currently on treatment in study period and all health providers working in TB and Leprosy (TBL) clinics during the study period. While the study population include sampled TB patients on the treatment of both intensive and continuation phase, sampled health care providers who were working in the TB clinic, and sampled hospitals that provide TB treatment services.

### Inclusion and exclusion criteria

The inclusion criteria are hospitals which provided diagnostic and treatment services, TBL focal persons who had worked at the facility for at least 2 weeks and above and TB patients who are ages 18 and above and take treatment for two weeks and above. While exclusion criteria are critically ill patient who could not talk or listen to the interviewer.

### Sample size

For sample size determination for observation and interview of providers, TB control activities in the six public hospitals were observed and all TBL focal persons in the respective hospitals were interviewed. While for exit interview, the total number of registered TB patients on both intensive and continuation phase in the selected public hospitals were 258. Since manageable and to get maximum sample size, all patients on the treatment in these six selected hospitals were included.

### Sampling technique

Five primary hospitals providing TB treatment services were selected randomly and since there was only one general hospital in

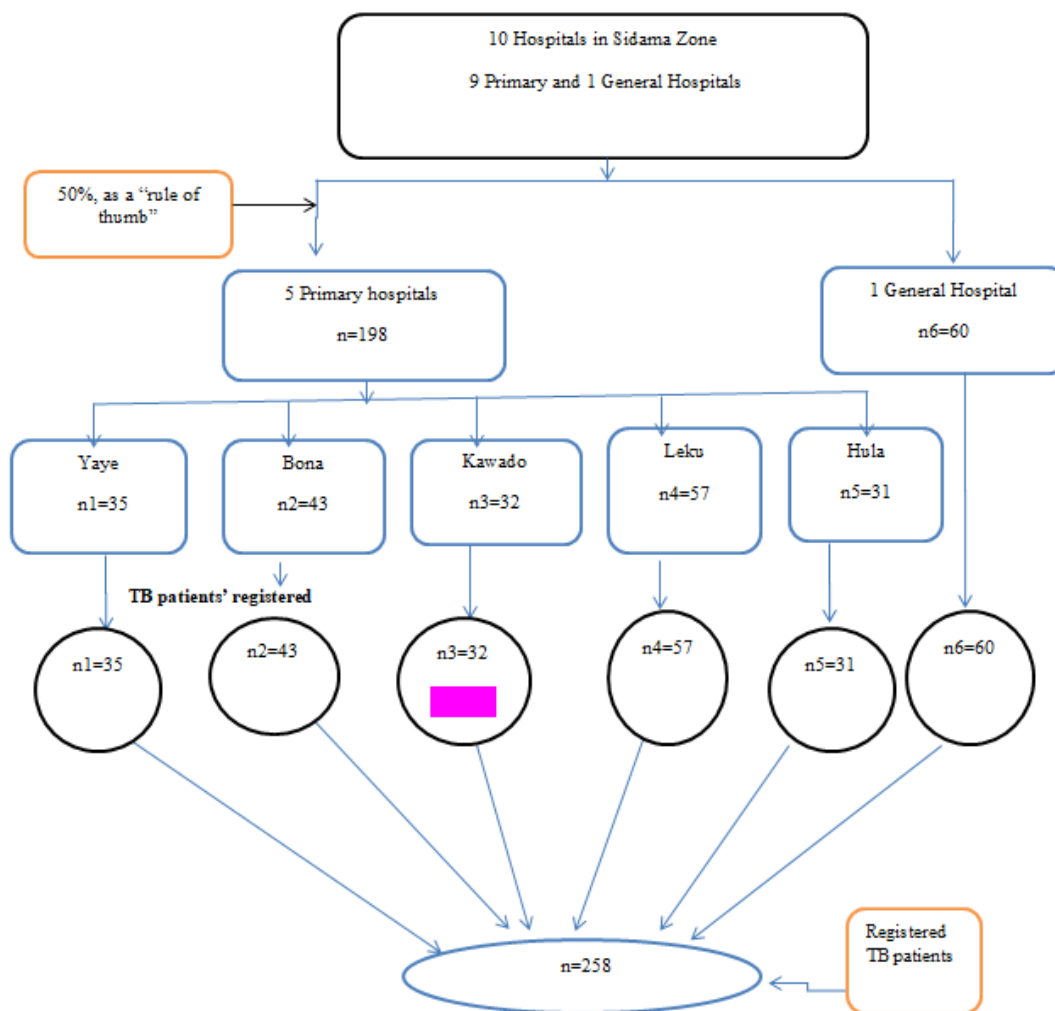


Figure 1. Diagrammatic representation of sampling procedure.

the zone and it was included in the study. The primary hospitals decided to be taken based on the rule of thumb in a sampling for quality of care study which states that if the number of units are very large (500-1000) take a 10% sample, if it is medium size (100-500), take a 20 to 30% sample and if it is very small (less than 50), take a 30 to 50% sample (Sidama zone finance and economic development department report, 2016). Hence, 50% samples from a sampling frame of 5 hospitals were taken. Exit interview was employed for those patients who fulfilled the inclusion criteria consecutively (Figure 1).

**Data collection procedures**

**Structural assessment**

Observation and inventory checklist were employed to get data for structural quality assessment of TB treatment services such as facility infrastructure, availability of different materials, laboratory supplies and staffing status. The tools were adapted from TBL manual and published literatures with some modifications (Federal

democratic republic ministry of health, April 2012; Edward and Jeremy 2006). In addition to this health workers in charge of TB clinic interview, instrument which contain any procedures/norms followed in the health facility like the AFB microscopy procedures, treatment, monitoring and follow-up of TB patients, and use of guidelines and manuals were used.

**Process assessment**

Semi-structured questionnaire which contains observations checklist related to provider-patient interaction and information provision.

**Outcome assessment**

A structured questionnaire was used for exit interview with patients after the completion of their treatment. It was adapted from published literatures (Hill et al, 2005; Elmahalli and Abdel-Aziz, 2007). The tool provides lists of alternatives to the patients. Its

content was patient's socio-demographic characteristics, interpersonal relationship between the patient and health care provider, availability of adequate resources and services, effectiveness of care (the extent to which care deliveries and its intended outcomes), and adequacy of information was included in the interview. Each study participant was asked to tell his/her level of satisfaction.

#### Data collection technique

##### Structural assessment

Data was collected by the six trained nurses using adapted national TB and leprosy control program performance monitoring checklist. While data on staff assignment, training on tuberculosis control and patterns of service delivery, and supervision were collected by self-administrated questionnaire to health care providers in the selected hospitals.

##### Process assessment

This was done by two trained health professionals (HO) who worked in the other hospital and were assigned to the TBL clinic. They were assigned to observe the provider-patient interaction and information provision.

##### Outcome assessment

The patients' satisfaction level assessment was also done by six trained nurses who speak the local language (sidaamufoo) to conduct the exit interviews by face-to-face using structured questionnaire.

#### Study variables

The structural study variables are infrastructure, staffing, availability ant-TB drugs, TB manuals, reporting forms, and registration books. The process variables are information provision and patient-provider interaction. Dependent variables are patients' satisfaction with TB treatment services. Independent variables are socio demographic characteristics such as age, sex, income, ethnicity, family size, religion, occupation, educational status, cost incurred, marital status, residence, and distance.

#### Operational definitions

##### Structural quality

Structural attributes of quality will be assessed using a checklist based on five categories: facility, staffing, materials, availability of ant-Tb drugs and laboratory supplies. An average score for structural quality will be computed by assigning a score of 1 for the presence of that aspect or positive responses, a score of 0, for the absence of that aspect or negative responses of each aspect. Maximum and minimum score will be calculated for each hospital. Then, percentage score will be calculated and structural quality will be classified as: very good (90-100), good (80-89), marginal (70-79), poor (60-69) and very poor (50-59) based on published literatures (Hill et. al., 2005; Elmahalli and Abdel-Aziz, 2007).

#### Availabilities of drugs, materials and laboratory supplies

The amount of essential TB drugs, materials and laboratory reagents sufficient for at least a 3 months will be computed by assigning score of 2 for available and in use, score of 1 for available but not in use and 0 for not available.

#### Patient satisfaction level

This was measured by using a Likert's scale which contains 15 items. Each item contains score on a five-point scale ranging from (1 = strongly dissatisfied, 2 = dissatisfied, 3 = neutral, 4 = satisfied, and 5 = strongly satisfied). The magnitude of score a respondent gives to 15 items, the maximum score is 75 and the minimum is 15. The percentage of maximum scale score was computed using the following formula.

$$\text{percentage mean score} = \frac{\text{actual score} - \text{potential minimum score}}{\text{potential maximum score} - \text{potential minimum score}} * 100$$

This formula gave individual percentage mean score and to know the overall level of satisfaction of the study population, the average of this score was taken (Tadesse et al, 2011).

#### Data analysis procedures

The data was edited, coded, and entered then double data entry verification was applied using Epi data version 3.1 and exported to SPSS version 20. Using SPSS version 20, descriptive statistics (frequency tables, mean, median, and range) was used to describe the structural, process and outcome assessment of the result. A simple linear regression analysis of variables was conducted to select candidate variables at P value <0.25. Finally, multiple linear regression analysis was used to assess the relationship between patients satisfaction and the independent variables and significance of the findings was declared at p<0.05.

#### Data quality control

Questionnaires were translated to local language (sidaamufoo) then back to English to ensure the consistency. To assure data quality, two supervisors and six data collectors were selected and trained for one day by principal investigator and 5% of the sample was pre-tested in non-selected hospital (Hawassa City Administration Adare hospital) before data collection. Completeness, accuracy and consistency of the collected data were checked on daily basis during data collection by supervisors and the principal investigator.

#### Ethical consideration

Ethical clearance was obtained from Jimma University College of Health Sciences ethical review board. Written permission was requested from Sidama Zone Administration, zonal health department and from each hospitals administration. Consent was obtained from individual interviewee subjects. At the time of data collection, data collectors read the written consent for each interviewee during interview, and a verbal consent was obtained from them. Client's privacy, confidentiality and cultural norms were respected properly.

**Table 1.** Availability and in use of materials (Manuals, Forms and Registers) in selected hospitals of Sidama Zone, Southern Ethiopia, July, 2016.

Manuals, forms and registers	Available and in use (%)	Available but not in use (%)	Not available (%)
Latest version of TLCP manual	3 (50)	2 (33.3)	1 (16.7)
Latest version of TLCP laboratory manual	3 (50)	1 (16.7%)	2 (33.3)
Latest version of TB unit registry	5 (83.3)	1 (16.7)	0
Latest TB referral and transfer form	3 (50%)	2 (33.3%)	1 (16.7)
Latest version of Tb sputum examination request form	4 (66.7)	2 (33.3)	0
Latest version of quarterly case finding, treatment outcome and other TB control activity report form	6 (100)	0	0
Flow chart for Diagnosis and treatment of PTB	3 (50)	3 (50)	0
Tb posters in different language	1 (16.7)	2 (33.3)	3 (50)
Weighting scale	5 (83.3)	11 (6.7)	0

## RESULTS

### Structural quality of TB treatment services

All the six public hospitals (Five primary and one general hospitals) included in the study and also 13 TB care providers participated in the study.

There were a total of 13 technical staff (health professionals) of TBL focal persons among these were six nurses, five health officers and remaining health workers were laboratory technicians and medical doctor.

All the hospitals had one health and laboratory professional assigned as full time workers who had basic training on TB treatment and diagnosis activities. All hospitals had at least one staff that had been trained on TB control activities of which only two had received refreshment trainings in the last 12 months.

Six TB service providers of studied hospitals were nurses and the mean service year of professionals was 4.8923 years (Range 6 months to 10 years). Eight TBL focal persons had no regular supervisor and supervisory schedule for TB control activities. Ten TBL focal persons had been supervised in the last 6 months while only three focal persons were supervised in the last 12 months.

They responded that during the last supervisory visit, supervisor(s) observed TB registry for all the TBL focal persons supervised. For two focal persons they delivered supplies, reviewed reports and discussed problems with them and for one focal person they provide current information related to TB control. Seven respondents claimed that the supervision was supportive while two respondents said that the supervision had no change. Only two focal persons who received supervisory feedback in the last 6 months where all of them had received it orally and none of them received either in

written form or on supervision registry form.

The care providers had been monitoring their patients' treatment compliance by daily filling of patients' unit TB registration form immediately after the patients took their pills in all of the studied hospitals during the intensive phase of therapy. Similarly, absentees were retrieved by their contact person and health extension workers.

### Availability of laboratory supplies, information, education and communication (IEC) materials and ant-TB drugs

All hospitals had and were using the latest version of quarterly case finding, treatment outcome and other TB control activity report form. Half of the studied hospitals had and were using the latest version of Tuberculosis and Leprosy Control Program (TLCP) manual, TLCP laboratory manual, referral and transfer form. Three of the studied hospitals were not available for TB posters in different language (Table 1).

The most important first line anti-TB drugs (rifampicin, isoniazid, pyrazinamide, Ethambutol and streptomycin) were available in all studied hospitals. The available anti-TB supplies are sufficient one month for existing patients. PFSA was the main source of drugs and laboratory supplies for TB control activities for all hospitals. Almost all hospitals received of these drugs and supplies were delivered to facility.

Regarding laboratory supplies and reagents all the studied hospitals had and were using binocular microscope, sputum cups, staining rack, staining reagents and boxes for keeping examined slides. The available laboratory reagents and supplies are enough for a

**Table 2.** Structural quality score of TB treatment services in public hospitals of Sidama Zone, July, 2016.

Hospital	Staffing	Availability of			Infrastructure	Average
		IEC materials	Anti-TB	Laboratory supplies		
Hospital 1	0.857	0.68	0.69	0.854	0.75	0.7662
Hospital 2	1	0.68	0.94	0.917	0.75	0.8574
Hospital 3	0.857	0.79	1	0.583	1	0.846
Hospital 4	0.857	0.79	0.88	0.604	1	0.8262
Hospital 5	1	0.98	0.94	0.708	1	0.9256
Hospital 6	0.857	0.79	0.88	0.729	1	0.8512
Simple average score	0.905	0.78	0.89	0.733	0.9	0.8512

\*Very good (0.9-1), good (0.8-0.89), marginal (0.7-0.79), poor (0.6-0.69), very poor (0.5- 0.59).

minimum of three months.

### Infrastructure

All studied facilities had separate TB treatment room and chair and table. Four studied hospitals had tape water supplies which are available for 24 h, but for the remaining two hospitals water supply was not connected with main source.

### Overall structural quality

The index of overall structural quality mean score was 0.85, which was graded as good (Table 2).

### Process of TB treatment services provision

Patient-provider interaction, communication between patient to care provider and health workers activities were assessed by observation.

### Patient-provider interaction and information communication

Patient-provider interaction process was observed during consultation session to determine provider activities with TB treatment services for those on follow up schedule patients.

A total of 48 sessions of patient-provider interaction were observed. Eight sessions from each selected hospitals were observed during consultation session/ follow up appointment.

Thirty-three (68.8%) patients had greeted in a friendly manner, 35 (72.9%) patients had participated in decision making process. Thirty three (31.3%) patients had spoken the same language with care providers.

On other hand, the information provision to the patients explain how to take their drugs, the provider explain when to return for the next treatment, and the provider explained the need to comply with the drug treatment were 35(72.9%), 10 (79.2%), and 40 (83.3%), respectively (Table 3).

### Patients' satisfaction level assessment

#### Socio-demographic characteristics of TB patients

Out of 258 participants intended to be included in the study, 251 (97.3%) patients had responded to the questionnaire. From the total patients, 132 (52.6%) were female. The mean age of respondents was  $40 \pm 13.70263$ . Majority of the respondents 169 (67.3%) were married.

Concerning educational status, 88 (35.1%) of the respondents attended primary school. One hundred fifty six (62%) of the participants were protestant in religion. The mean monthly family income of respondents was  $926.99 \pm SD 946.02$  ETB. Occupationally, 139 (55.4%) of the respondents were farmers (Table 4).

#### Service area related factors

The majority of respondents 160 (69.3%) does not incur cost during their visit to TB clinic. Of the 251 respondents, 204 (81.3%) had visited the facility previously. The mean distance of health facilities were  $1.2709 \pm .44532$  km. One hundred eighty two (72.5%) of the respondents traveled on foot to reach hospitals are shown in Table 5.

#### TB patients' satisfaction level with TB treatment services

Majority of the respondents 105 (41.8%) were satisfied

**Table 3.** Description of provider-patient interaction and communication pattern of services provision in the selected hospitals of Sidama zone, July, 2016.

<b>Provider-patient interaction</b>	<b>Yes (%)</b>	<b>No (%)</b>
Provider great the patient in a friendly/polite manner	33 (68.8)	15 (31.3)
Patient participate in part of decision making process	35 (72.90)	13 (27.15)
Provider and patient speak the same language	33 (68.8)	15 (31.3)
<b>Information provision</b>		
The provider explain how to take the drugs	35 (72.9)	13 (27.1)
The provider explain when to return for the next treatment	38 (79.2)	10 (20.8)
The provider explain the need to comply with the drug treatment	40 (83.3)	8 (16.7)
The provider explain when follow-up sputum microscopy is done	25 (52.1)	23 (47.9)
The provider advices the patient to bring any family member/neighborhood Having sign and symptoms of Tb to the health facility	20 (41.7)	28 (58.3)
The provider ask the patient for any concerns regarding the treatment	36 (75.0)	12 (25.0)
The provider respond to the client's question	27 (56.3)	21 (43.8)

with working hours. 147 (58.6%) respondents were satisfied with waiting time. 134 (53.4%) and 119 (47.4%) of the respondents were satisfied by overall cleanliness of the waiting area and overall comfort of the waiting area, respectively.

On the other hand, study participants were strongly dissatisfied with completeness of the information given to patients about treatment and effectiveness of the services were 3 (1.2%) and 15 (6.0%), respectively shown in Table 6.

### **Overall patients' satisfactions with TB treatment services**

The average level patient satisfaction score (the mean of percentage of maximum scale score) with TB treatment services was 71.6%. A maximum score of 86.67, a minimum of 35.00, and the range was 51.67.

### **Factors affecting the level of patients' satisfaction**

In order to assess the association between socio-demographic characteristics and the average level patient satisfaction score with TB treatment services, simple linear regression analysis was conducted.

Variable like marital status, ethnicity, educational status, occupation and family size are eligible for multivariate analysis at  $p < 0.25$ . No significant associations were observed between sexes, age, religion, residence, and average monthly family income (Table 7).

Also, among the respondents attributes in TB control

activities, three variables like incur cost for visit TB clinic, purpose of cost incur and duration of your treatment of TB treatment were associated with patients satisfaction score in bivariate analysis ( $p < 0.25$ ) (Table 8).

### **Independent predictors of patient satisfaction with TB treatment services**

Multiple linear regressions with enter methods were carried out to identify predictors of the average level of patient satisfaction score with TB treatment services. Table 9 shows the regression estimates and the relative effect of each predictor variable on average level patient satisfaction score of patients on TB treatment services provision. Variables like cannot read and write, higher education completed, intensive phase of TB treatment and ethnicity of Gurage were found statistically significant in association with average level satisfaction score of patients ( $p < 0.05$ ).

When a unit increase cannot read and write, the respondents had an average decreased of patient satisfaction score by 1.43 units (95% CI: -4.364, -1.505). Also, a unit increase for completed their higher education of the respondents had an average decrease in the patient satisfaction score by 2.447 units (95% CI: -7.349, -2.455).

However, unit increase the intensive phase of TB treatment service had an average decrease of 3.415 unit in average level of patient satisfaction score (95%CI: -7.445, -0.615). On other hand, respondents who were Gurage ethnicity had 4.224 units in greater satisfaction score when compared with Sidama ethnicity counter



**Table 4.** Socio demographic characteristics of TB patients in selected hospitals of Sidama Zone, Southern Ethiopia, July, 2016.

<b>Socio-demographic factors (N=251)</b>	<b>Frequency</b>	<b>%</b>
<b>Sex</b>		
Male	119	47.40
Female	132	52.60
<b>Age</b>		
15-29	67	26.70
30-44	90	35.90
45+	94	37.40
<b>Ethnicity</b>		
Sidama	145	57.80
Amhara	39	15.50
Oromo	37	14.70
Gurage	18	7.20
Others	12	4.80
<b>Residence of the patients</b>		
Urban	93	37.1
Rural	158	62.9
<b>Marital status</b>		
Single	54	21.50
Married	169	67.30
Divorced	11	4.40
Widowed	17	6.80
<b>Educational status</b>		
Cannot read and write	35	13.90
Read and Write only, no formal schooling	73	29.10
Primary school	88	35.10
Secondary school	43	17.10
Higher education	12	4.80
<b>Religion</b>		
Muslim	27	10.80
Protestant	156	62
Orthodox	51	20.30
Catholic	17	6.80
<b>Occupation</b>		
Farmers	139	55.40
Government employee	5	2.00
Daily labor	18	7.20
Merchant	36	14.30
House wife	43	17.10
Student	10	4.00
<b>Monthly income</b>		
<500	128	51.00

**Table 4.** Contd.

501-1000	43	17.10
>1001	80	31.90
<b>Family size</b>		
1-3	68	27.10
4-7	174	69.30
7+	9	9.30

**Table 5.** Description of respondents attributes in TB control activities in the selected hospitals of Sidama Zone, July 2016.

<b>Service related factors (N=251)</b>	<b>Frequency</b>	<b>Percentage</b>
<b>Incur cost for your visit</b>		
No	160	63.70
Yes	91	36.30
<b>Ever visited this clinic for TB services before</b>		
No	47	18.70
Yes	204	81.30
<b>Duration of your treatment</b>		
Intensive phase	26	10.40
Continuation phase	225	89.60
<b>Have problem with the treatment</b>		
No	85	33.90
Yes	165	65.70
<b>Able to get the TB clinic easily</b>		
No	49	19.50
Yes	202	80.50
<b>Means you normally get to the TB clinic</b>		
Walking	182	72.50
Vehicle	48	19.10
Car	18	7.20
<b>How long it normally takes TB clinic</b>		
<2.5 km	183	72.90
>2.5 km	68	27.10

parts (95% CI: 1.534, 7.913).

## DISCUSSION

Treatment of TB is the cornerstone of any National Tuberculosis Programme. Assessing the quality of tuberculosis treatment services is important, because it

tells us how the health system is performing and leads to improved care. In this study, an effort has been made to identify information related and constraints in all components (structural, process and outcome) of TB care using Donabedian's quality assessment model in health care.

Structures/Input requirements for TB treatment services provision were assessed using national TB and leprosy

**Table 6.** Level of patient satisfaction with TB treatment services in selected public hospitals of Sidama Zone, Southern Ethiopia, July, 2016.

Variable (N=251)	V.D	Ds	Neutral	Sat.	V.Sat
	N (%)	N (%)	N (%)	N (%)	N (%)
Satisfied with working hours	26 (10.48)	4 (33.5)	20 (8.0)	105 (41.8)	16 (6.4)
Waiting time	4 (1.6)	33 (13.1)	23 (9.2)	147 (58.6)	43 (17.1)
Time spent with health worker	4 (1.6)	24 (9.6)	24 (9.6)	143 (57.0)	55 (21.9)
Overall cleanliness of the waiting area	5 (2.0)	26 (10.4)	32 (12.7)	134 (53.4)	53 (21.1)
Overall comfort of the waiting area	5 (2.0)	31 (12.4)	28 (11.2)	119 (47.4)	68 (27.1)
Over cleanliness of the examination room	3 (1.2)	25 (10.0)	24 (9.6)	135 (53.8)	64 (25.5)
Cleanliness of instrument or equipment used	2 (0.8)	24 (9.6)	32 (12.7)	130 (51.8)	63 (25.1)
Experienced shortage of drugs during your treatment period	1(0.4)	20 (8.0)	17 (6.8)	133 (53.0)	80 (31.9)
Availability of all the services	3 (1.2)	23 (9.2)	19 (7.6)	134 (53.4)	72 (28.7)
Respect offered by the provider	5 (2.0)	20 (8.0)	18 (7.2)	142 (56.6)	66 (26.3)
Assure privacy during examination and treatment	9 (3.6)	30 (12.0)	17 (6.8)	141 (56.2)	54 (21.5)
Provider's skill and ability in treating your problem	4 (1.6)	19 (7.6)	19 (7.6)	138 (55.0)	71 (28.3)
Completeness of the information given to you about your problem	3 (1.2)	23 (9.2)	26 (10.4)	132 (52.6)	67 (26.7)
Satisfied with the cost incur	1 (0.4)	8 (3.2)	18 (7.2)	142 (56.6)	82 (32.7)
Effectiveness of the service	15 (6.0)	27 (10.8)	16 (6.4)	125 (49.8)	68 (27.1)

\*VD: Very dissatisfied, Ds: dissatisfied, Sat.: satisfied, V.Sat.: very satisfied.

control program performance monitoring checklist. The main findings from service management and staffing of TB care, all studied hospitals were staffed by full time trained focal persons. Of them, only two TB clinic care providers and laboratory professionals had received refresher trainings within the previous one year. These findings are inconsistent with study conducted in Addis Ababa where all of them had received refreshment trainings in the last 12 months (Gezahegn et al., 2014). Moreover, it was also in contrary to WHO recommendation, "all health workers should be familiar with recent information at least once in a year (World Health Organization (2015). This difference may be due to high staff turnover. To maintain quality in implementation of TB treatment services, care providers and laboratory technicians must be updated to current evidence-based information. Training is also necessary to encourage adherence to national protocols and guidelines introducing some degree of standardization in both treatment and diagnosis (Federal democratic republic ministry of health, April 2012).

There were weak supervision patterns as there was very small proportion of TBL focal persons got chance of being supervised in the 12 months and the supervision pattern was also unplanned and lack the written form of feedback, which opposes the guidelines for clinical and programmatic management of TB, leprosy and TB/HIV in Ethiopia recommendations where they recommend strong supportive supervision as part of program communication (Federal democratic republic ministry of

health, April 2012). This discrepancy might be due to hospital administration not integrated supportive supervision services with other programs.

Half of the studied hospitals had and were using the latest version of TLCP manual, TLCP Laboratory Manual and TB referral, flow chart for diagnosis and treatment of PTB. This finding was not in line with studies conducted in Addis Ababa private facilities and Bahir Dar city administration public health facilities which were available in all health facilities (Gezahegn et al., 2014). The possible reason for this discrepancy might be lack of emphasis by different authorities and concerned bodies in the zone and region.

From the drug and diagnostic supplies of structural quality of TB cares, all of the studied hospitals that had first line anti-TB drugs were sufficient for one month. It was consistent with the national minimum recommendation, of "every facility should have at least one month stock level for existing patients" (The Federal Democratic Republic of Ethiopia Ministry of Health, 2015; Federal democratic republic ministry of health, April 2012). It is also not comparable with the findings of studies conducted in Jimma Zone where 90.0% of the facilities had TB drugs sufficient for at least 3 months, which may be due to frequent stock out of ant-TB drugs were common in the area (Elmahalli and Abdel-Aziz, 2007). The WHO and FMOH recommended that adequate supply of drugs and equipment's are part of programmatic activities at each level of TB control Programme (Mehret et al., 2016).

**Table 7.** Socio-demographic determinants of patient satisfaction score with TB treatment services at public hospitals of the Sidama Zone, Southern Ethiopia, July, 2016.

Items (N=251)	No (%)	P-value	Unstandardized $\beta$	Coefficient 95% CI for $\beta$
<b>Sex</b>				
Female*	132 (52.6)	0.902	-0.116	(-1.981, 1.748)
Male	119 (47.4)			
<b>Age</b>	-	0.893	0.005	(-0.063, 0.073)
<b>Marital status</b>				
Married*	169 (67.3)	-	-	-
Single	54 (21.5)	0.129	-1.778	(-4.075, .519)
Divorced	11 (4.4)	0.726	-0.816	(-5.388, 3.757)
Widowed	17 (6.8)	0.146	-2.768	(-6.507, .971)
<b>Ethnicity</b>				
Sidama*	145 (57.8)	-	-	-
Amhara	39 (15.5)	0.55	1.464	(-3.352, 6.279)
Oromo	37 (14.7)	0.108	3.968	(-.878, 8.814)
Gurage	18 (7.2)	0.021	6.435	(1.999, 11.872)
<b>Educational status</b>				
Primary school*	88 (35.1)	0.040	-2.526	(-5.446, -0.394)
Cannot read and write	35 (3.9)			
Read & Write only	73 (29.1)	0.338	-1.128	(-3.441, 1.185)
Secondary school	43 (17.1)	0.041	-2.838	(-5.557, -0.119)
Higher education	12 (4.8)	0.05	-4.482	(-8.979, -0.014)
<b>Religion</b>				
Protestant*	156 (62)	0.27	-1.719	(-4.78, 1.346)
Muslim	27 (10.8)			
Orthodox	51 (20.3)			
<b>Residence</b>				
Rural*	158 (62.9)	0.731	-0.336	(-2.264, 1.591)
Urban	93 (37.1)			
<b>Monthly income</b>				
Occupation	0.406	0.273	0	(-0.001, 0.001)
Farmer*	139 (55.4)	0.210	-3.753	(-10.478, 2.972)
Government employer	5 (2.0)	0.574	-2.364	(-6.065, 1.337)
Daily labor	18 (7.2)	0.749	-0.79	(-3.553, 1.973)
Merchant	36 (14.3)	0.396	-0.42	(-2.998, 2.159)
Housewife	43 (17.1)	-	-2.086	(-6.924, 2.751)
Student	10 (4.0)	-	-	-
<b>Family size</b>	-	0.106	0.575	(-.123, 1.273)
<b>How long it normally takes TB clinic</b>				
<2.5 km*	183 (72.9)	0.574	0.598	(-1.495, 2.692)
>2.5 km	68 (27.1)			

\*Reference category (the highest frequency taken as reference categories).

**Table 8.** Association between the average level of patient satisfaction score with TB treatment services and description of respondents attributes in TB control activities in public hospitals of Sidama Zone, Southern Ethiopia, July, 2016.

Items (N=251)	No (%)	p-value	Unstandardized $\beta$	coefficient 95% CI for $\beta$
<b>Incur cost for your visit</b>				
No*	160 (63.7)	0.243	-1.147	(-3.078, 0.784)
Yes	91 (36.3)			
<b>Ever visited this clinic for TB services before</b>				
Yes*	204 (81.3)	0.436	0.943	(-1.440, 3.327)
No	47 (18.7)			
<b>Purpose of incur cost</b>				
No cost incur*	161 (64.1)	-	-	-
Transport	57 (22.7)	0.768	0.083	(-2.604, 1.924)
Food and reception	33 (13.1)	-0.34	-2.482	(-5.289, 0.325)
<b>Duration of your treatment</b>				
Continuation phase*	225 (89.6)	0.008	-4.115	(-7.12, -1.104)
Intensive phase	26 (10.4)			
<b>Have problem with the treatment</b>				
Yes*	165 (65.7)	0.662	0.437	(-1.529, 2.403)
No	85 (33.9)			
<b>Able to get the TB clinic easily</b>				
Yes*	202 (80.5)	0.613	-0.603	(-2.951, 1.745)
No	49 (19.5)			
<b>Means you normally get to the TB clinic</b>				
Walking*	182 (72.5)	-	-	-
Vehicle	48 (19.1)	0.655	0.543	(-1.849, 2.934)
Car	18 (7.2)	0.595	-0.98	(-4.630, 0.660)
<b>How long it normally takes TB clinic</b>				
<2.5 km*	183 (72.9)	0.574	0.598	(-1.495, 2.692)
>2.5 km	68 (27.1)			

\*Reference category (the highest frequency taken as reference categories).

About service accessibility and infrastructure, 4 studied hospitals had tap water supplies which is available for 24 h but the remaining 2 were water supplies not connected with main source which is inconsistent with National Guideline of Ethiopia (Federal democratic republic ministry of health, April 2012). All the hospitals have separate room for TB treatment.

The overall structural quality score of the current study is 0.85. Majority of the studied facilities were structurally good. This finding is better than other study conducted in Jimma zone with overall structural qualities score of 0.56 (Elmahalli. and Abdel-Aziz, 2007). This might be due to

difference of setting and time difference.

Effective interpersonal communication between health care providers and patients are one of the most important elements for improving patient satisfaction, treatment adherences and outcomes (World Health Organization, 2007). The findings of this study revealed that the provider does not only greet the patient in a friendly/polite manner was 31.3% of the sessions, patient not participate in part of decision making process was 27.15% and provider and patient not speak the same language was 31.3%. This finding is opposed by a study in Addis Ababa where all health facilities demonstrate

**Table 9.** Independent predictors of patient satisfaction score with TB treatment services in selected public hospitals of Sidama zone, Southern Ethiopia, July, 2016.

Variable	P-value	Unstandardized coefficients $\beta$	Standardized coefficients $\beta$	95.0% Confidence interval $\beta$	
				Lower bound	Upper bound
Constant	0	72.774	0.021	68.295	77.253
Single	0.788	0.376	-0.107	-2.373	3.125
Widowed	0.121	-3.182	-0.066	-7.208	0.843
Cannot read and write	0.038*	-1.430	-0.094	-4.364	-0.505
Secondary school completed	0.183	-1.867	-0.070	-4.621	0.887
Higher education completed	0.026*	-2.447	-0.018	-7.349	-0.455
Daily labor	0.784	-0.533	-0.007	-4.366	3.3
Family size	0.934	-0.038	-0.010	-0.944	0.868
Cost incur to visit TB clinic	0.892	-0.162	-0.087	-2.504	2.179
Cost for food	0.241	-1.924	-0.140	-5.147	1.299
Intensive phase of TB treatment	0.018*	-3.415	0.044	-7.445	-0.615
Ethnicity Oromo	0.497	0.916	0.146	-1.735	3.568
Ethnicity Gurage	0.025*	4.224	0.021	1.534	7.913

greeting, respectful, and participating in decision making process (Gezahegn et al., 2014). This might be adequate for lack of supportive supervision and refreshment training.

Also information provision/communication between care providers show that the provider explain how to take the drugs, explain when to return for the next treatment and advices the patient to bring any family member/neighbor having sign and symptoms of TB to the health facility was 72.9, 79.2 and 41.7%, respectively. This finding is lower than with the study conducted in public facilities of a Bahir Dar city administration where 80.5% patients were advised how to take drugs and 81.6% patients were told when the next follow-up will be (Mulatu et al., 2015). The possible reason for this might be due to lack of adequate follow-up of trained health professionals working in TB clinic.

Patient satisfaction is an important quality outcome indicator of health care in the hospital setting. This study revealed that the average level of patients satisfaction score with TB treatment services was 71.6% (M=3.8629, SD=0.29895). The average level of patients' satisfaction score was lower than a study conducted in Sidama Zone in public health facilities and Addis Ababa in private health facilities revealed that 90 and 75% of the respondents are satisfied with TB treatment service, respectively (Gezahegn et al., 2014).

The possible reason for this discrepancy might be due to lack of strong supportive supervision and care providers do not receive refreshment training.

The average level of patients' satisfaction score in this study was higher than the study conducted in public health facilities of Bahir Dar city administration where about 53.8% of respondents were fully satisfied with their

TB treatment services (Mulatu et al., 2015). This also may be due to the difference of setting.

Based on the multiple linear regression analysis result, educational status of the respondents was predictor of patient satisfaction. When unit increase cannot read and write, the respondents had an average decrease of patient satisfaction score by 1.43 units (95% CI: -4.364, -1.505). And also unit increase completed their higher education of the respondents had an average decrease of patient satisfaction score by 2.447 units (95% CI: -7.349, -2.455). This is in contrast with the study done in Sidama zone (Zekariyas et al., 2013). The possible reason might be due to time difference.

However, unit increase of the intensive phase of TB treatment service had an average decrease of 3.415 unit in average level of patient satisfaction score (95% CI: -7.445, -0.615). The one possible reason for this might be as an increase in duration of TB treatment, the patients' adherence with treatment and decrease in their sign and symptoms which might increase their satisfaction. This was supported by earlier studies that found the duration of TB treatment to be significant predictor of patients satisfaction

On other hand, respondents who were Gurage ethnicity had 4.224 units in greater satisfaction score when compared with Sidama ethnicity counter parts (95% CI: 1.534, 7.913). It was difficult to discuss here.

Social desirability bias is likely in this study as the respondents were interviewed in the wards of the hospital. Might be only satisfied patients usually visit health facility.

This study might suffer from Hawthorn effect (the Hawthorne effect is when a group of people who know they are being studied and watched perform tasks better

or improve behavior).

## Conclusion

In this study, the average level of patients' satisfaction with TB treatment service was found to be low. Most of the minimum required resources to conduct the service were available in the hospitals. Almost half of the studied hospitals had and were not using IEC materials. Majority of the studied hospitals is structurally good. The major gaps identified in the majority of the hospitals were lack of refreshing training and supportive supervision. Regarding the patient-provider interaction of TB patient, care in all assessed hospitals was poor. Moreover, more than half of the patients had not given information to bring any family member/neighborhood having sign and symptoms of TB. Patient cannot read and write, completed higher education, and intensive phase of TB treatment were found to be independent predictors of patient satisfaction.

## RECOMMENDATION

Based on the findings of this study, the following recommendations were forwarded: (1) to health care providers: (a) success of anti-TB therapy could be ensured through strict adherence to all the elements of TB treatment strategy, (b) great emphasis should be given for interaction and communication with patients, (c) as patients' satisfaction was not as such satisfactory, attentions should be given for those areas where greater dissatisfaction was observed like waiting time and patient respect on overall cleanliness of the waiting area and provision of complete information; (2) to all hospitals administration: regular supervision and follow up should be strengthened; to Sidama Zone Administration Health Department: (a) ongoing (refreshment) training and training on communication skills should be given for health workers, (b) procurement/distribution/supplies and IEC materials (flip charts and posters) and follow-up of their utilization should be ensured; (3) to regional health bureau: (a) Capacity strengthening supports for TB treatment sites should be continued to improve services of infrastructure, waiting areas, IEC materials and equipment, (b) mobilizing government and nongovernmental organizations to prepare refresher training; and (4) to researcher: in this study, ethnicity was the positive effect on patient satisfaction, therefore it needs further study.

## Ethics approval and consent to participate

Before any attempt, ethical clearance was obtained from Jimma University College of Health Sciences ethical

review board. Written permission was requested from Sidama Zone Administration, Zonal Health Department and from each hospitals administration. Consent was obtained from each individual interviewee subjects, and a verbal consent was obtained from them. Client's privacy, confidentiality and cultural norms were respected properly.

## CONFLICT OF INTERESTS

The authors have not declared any conflict of interests

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## ABBREVIATIONS

**DOTS**, Directly observed treatment short course; **FMOH**, Federal Ministry of Health; **HIV/AIDS**, human immune virus/acquired immune deficiency syndrome; **IOM**, Institute of Medicine; **ISTC**, International Standards for TB Control and Care; **MDR**, TB multidrug resistant tuberculosis; **NGO**, non-governmental organization; **RHB**, Regional Health Bureau; **SNNPR**, Southern Nation, Nationality and People Regional State; **SPSS**, Statistical Package for Social Science; **TB**, tuberculosis; **TLCP**, Tuberculosis and Leprosy Control Program; **WHO**, World Health Organization; **WOHO**, Woreda Health Office; **ZHD**, Zonal Health Department.

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*Full Length Research Paper*

# **Occurrence of diarrhea and utilization of zinc bundled with ORS among caregivers of children less than five-years in Addis Ababa, Ethiopia**

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In response to the high occurrence of diarrhea in Ethiopia, the Federal Ministry of Health employed an effective strategy that included administration of zinc together with oral rehydration salt to treat children suffered diarrhea since 2013. Nonetheless, information on zinc bundled with ORS uptake is limited and thus this study has examined zinc utilization among beneficiaries. A community based cross-sectional study was conducted among 422 households whose under-five- children (U5C) had diarrhea in *Akaki* sub city from February to March, 2016. Prior to selection of households, participants were identified through health facilities and were traced using their household number. Relevant socio-demographic and other important health information were collected from respective caretakers using a pre-tested structured questionnaire through interview. Data were then entered using Epi Info Version 3.5.4, exported and analyzed using SPSS version 20 software. Both bivariate and multivariate regression analyses were used to identify the factors related to zinc utilization and a p-value below 0.05 was considered as statistically significant. All recruited subjects participated in the study with 100% response rate. Of the 422 participants, 283 (67.1%) caretakers used zinc bundles with ORS when the under-five-child had diarrhea. The majority (82.2%) sought treatment from health centers though their major (80.90%) source for zinc was private pharmacies. Following zinc intake, diarrhea subsided within 1-3 days in most (76.3%) of them. About the same proportion of caretakers recommended the zinc for watery diarrhea and the vast majority (90.5%) were satisfied with zinc supplement. Caregivers' whose child diarrhea stopped were more likely (AOR=10.29; 95% CI=2.52-42.05) to use zinc while those whose child diarrhea stopped after six days (AOR=0.09; 95% CI=0.02-0.45) and had mucoid diarrhea (AOR=0.32; 95% CI=0.10-0.97) were less likely to give their children the zinc than their counterparts. The study thus revealed that slightly over two in three children were given diluted zinc and the major augmenting factors for the zinc bundled with ORS uptake were withholding to administer the full dose, stopping the drug when diarrhea improved and recommending zinc therapy. It is thus essential to consider the above determinants, avail the zinc in the government facilities, improve zinc bundled with ORS intake and ultimately reduce deaths emanating from diarrhea.

**Key words:** Diarrhea, Zinc utilization, determinants, cross sectional community based study, Ethiopia

## INTRODUCTION

Children diarrhea is one of the major killers in most developing countries with infants and young children the most vulnerable in most developing countries (Fischer Walker et al., 2012). Studies have shown that under-five-children go through 2.9 episodes of diarrhea per year in developing countries leading to depletion of zinc in the body and consequently aggravate any pre-existing zinc deficiency (Fischer Walker et al., 2012; Brown et al., 2004). Zinc deficiency, in addition to exacerbating diarrheal episode, predisposes to several morbidities and malnutrition (Fischer Walker et al., 2009; Shankar and Prasad, 1998; Bhutta et al., 1999), indicating that zinc is an important micronutrient which plays a critical role in cellular growth and function of the immune system (Omuemu, 2012). Available evidences suggests that supplementing zinc and oral rehydration salt (ORS) would benefit children with diarrhea due to the above mentioned effect and consequently reduces the incidence as well as duration and severity of acute and persistent diarrhea (Walker and Black, 2010; WHO and UNICEF, 2004; Fischer Walker et al., 2009).

Cognizant of the benefits of zinc and the magnitude of diarrhea, WHO and UNICEF recommends 20 mg zinc for young children, 10 mg zinc for infants under six months of age to be given with ORS for 10–14 days for diarrhea treatment (WHO and UNICEF, 2004) while feeding is continued; along with increasing the amount of fluid to reduce dehydration and other health consequences. Based on the guideline of WHO/UNICEF diarrheal management, a number of developing countries including Ethiopia adopted zinc supplement to their national policy on diarrhea treatment, though the majority still are not employing the initiatives due to caretakers and frontline health workers knowledge gap of zinc including unavailability of zinc in the government sectors (Ogunrinde et al., 2011; Uchendu et al., 2011).

In Ethiopia, diarrhea accounts for about 14% of outpatient visits and 16% hospital admissions attributed to poor hygienic practices and gap of knowledge among caretakers and some frontline health workers with the new diarrheal management initiatives which includes zinc bundles with ORS (Walker and Black, 2010; WHO and UNICEF, 2004). In addition to the above traits, chronic child malnutrition compounded by low consumption of animal sources of food indicates that zinc deficiency is prevalent and there is high possibility for the occurrence of child diarrhea (Fischer Walker et al., 2009; Central Statistical Agency [Ethiopia] and ICF International, 2012; Wanzahun Godana, 2013). According to the 2011

demographic health survey, the magnitude of childhood diarrhea has a diverse figure and ranged from 30 to 13.7%, showing some regional variations while information on zinc utilization is unavailable indicating that it is a gap to be addressed (Wanzahun Godana, 2013). This study has addressed the above gap and examined the utilization of the new zinc initiative including its augmenting factors to provide evidence based information for some program improvement.

## METHODS

### Study design and settings

A community based cross-sectional study was conducted among 422 households whose under-five children had diarrhea in *Akaki* sub city, Addis Ababa, Ethiopia from February to March, 2016. The sub-city constitutes 11 districts of which 8 are urban and the rest are partially rural and were home for 224,370 people with female population being 51.5%. The sub city had 6 government owned and one private health centers (Central Statistical Agency [Ethiopia] and ICF International, 2012). Also, 3 districts that reported high figure of diarrhea were purposively selected.

### Study populations

Prior to selection of households, participants were identified through health facilities and were traced using their household number. All caretakers who had under-five-children and sought treatment for diarrhea in the last three months prior to the study in the sub-city were identified from all facilities in the sub-city. From this list, household information was picked for the sampled districts and a fresh list of household consisting of 2030 was prepared to constitute the sampling frame.

### Sample size determination and sampling procedures

The sample size was determined using single proportion formula based on the estimation of the proportion of diarrhea in the study area; which implies that 50.0% (Central Statistical Agency [Ethiopia] and ICF International, 2012), absolute precision of 5.0 and 95% level of confidence with a non-response rate of 10% yielded a total of 422 subjects. To sample the households, the sampling frame was divided by the sample size and accordingly, every fifth household with a random start was selected from the sampling frame until the required sample size was reached. The sampled households were then traced through the female health extension workers' place of residence and were recruited after their verbal consent was obtained based on the inclusion criteria (caretakers with under-five children who sought diarrheal treatment and permanent resident with no disability). Each voluntary caretaker from the respective households was face-to-face interviewed at their home at their convenience.

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### Data collection instrument and procedure

Data were collected using a pre-tested structured questionnaire by reviewing previous similar studies conducted (Brown et al., 2004; Fischer Walker et al., 2009; Shankar and Prasad, 1998; Bhutta et al., 1999; Omuemu, 2012; Walker and Black, 2010; George et al., 2013; Central Statistical Agency [Ethiopia] and ICF International, 2016; Larson et al., 2011) that captured the study objectives. The questionnaire included information on socio-demographic/economic characteristics, caregiver practice in terms of giving fluid during diarrhea, feeding, zinc utilization including its sources and other household hygienic practices. Eleven data collectors comprised of Health Extension workers (HEWs), graduate nurses fluent in the local languages and two supervisors (Health Officers) with relevant experience were recruited and trained for two days by the investigators on the method of data collection. The training addressed issues such as the content of the questionnaire, basic interviewing skills, and filling out of the questionnaire.

### Data quality management

The quality was observed at different levels and included the followings: due emphasis was given to questionnaire designing to capture the objectives of the study, logically sequenced, free of scientific terms and non-leading structured questionnaire and pre-tested on 5% of caretakers in non-sampled districts of the sub-city. The data collectors and supervisors were trained on the objective of the study, contents of the questionnaires and how to maintain confidentiality and privacy of the study subjects. The collected data were checked by the investigator on daily basis for any incompleteness and/or consistency and timely action was made.

### Statistical analysis

Data were checked for completeness, coded, and entered using Epi-Info version 3.5.4 and then exported to SPSS version 20 for cleaning and analysis. The results are presented in percentages and tables/graphs where appropriate. Binary logistic regression was employed to examine the associations between socio-demographic variables and the outcome variables (zinc bundled with ORS uptake). To ascertain the association between the dependent and explanatory variables, simultaneous control for the aforementioned explanatory variables (all socio-demographic characteristics and other covariates associated in bivariate with  $p < 0.2$  were used and entered) step-wise logistic regression was applied and adjusted odds ratios (AORs) and confidence intervals (95% CI) were calculated. In all analyses,  $P < 0.05$  was considered to be statistically significant.

### Operational definitions

**Acute diarrhea:** Abrupt onset of three or more loose stools per day and lasts no longer than 14 days.

**Caretaker:** Any caregiver who brought the child to health center.

**Zinc supplements:** Refers to provision of 20 mg zinc for young children or half for infants below six months of age together with ORS for 10–14 days as diarrhea treatment.

**Oral rehydration salts (ORS):** Refers to a balanced glucose–electrolyte mixture.

### Ethics approval and consent to participate

Ethical approval was obtained from the School of Public Health Research Ethics Review Committee of Addis Ababa University, College of Health Sciences. Permission was also secured from the Regional Health Bureau as well as from the respective district administration and Health Office. Verbal consent was obtained from each caretaker after the objective of the study was explained to all of them in their local language and the right to withdraw from the study at any time was also communicated. Anonymity and confidentiality of the information was assured and privacy of each respondent was maintained throughout the data collection process.

## RESULTS

A total of 422 caretakers participated in the study with a response rate of 100%. The majorities (98.3%) of them were from urban settings and were females (91.0%). About half (49.8%) had age range between 31 and 40 years and nearly two-thirds (63.0%) had formal education and over half (55.7%) had their own business. The majorities (88.2%) were married and over half (52.6%) had between one and two children. In terms of child sex, female (51.7%) was slightly higher than male (48.3%) children. Nearly three-quarters (71.1%) of the affected age groups were children below the age of 23 months (Table 1).

As shown in Figure 1, slightly over two-thirds (67.1%) of caretakers used the zinc bundle with ORS during the recent diarrheal attack.

Table 2 demonstrates participants' response to Zinc bundled with ORS uptake/supplement and other important characteristics. All participants heard about zinc supplement and their major source of information was through television (50.7%). Over a quarter (29.1%) of them preferred treating child with diarrhea with antibiotic and 107 (25.4%) used antispasmodic syrup and 57 (13.5%) mentioned zinc supplements which is low. The majority (82.2%) sought treatment from health centers though their major (80.90%) source of obtaining the zinc was from private pharmacy and about the same proportion of them diluted in water. Slightly over half (52.3%) administered zinc for seven days because the diarrhea stopped in 128 (45.2%). Some of the reasons stated for not giving the prescribed full dose of zinc was due to its unpleasant taste (15.2%), vomiting (12.3%) and diarrhea (26.8%). On the other hand, reasons stated for not using the zinc was unawareness in 57 (41.0%), unsure of administering the zinc in 29 (20.9%) and its cost was expensive in 53 (38.1%). Following zinc intake, over three-quarters mentioned that diarrhea subsided within 1-3 days; about the same number of respondents recommended zinc for watery diarrhea and the vast majority (90.5%) was satisfied with the zinc supplement.

Table 3 displays the result of binary logistic regression and revealed that zinc bundled with ORS utilization was

**Table 1.** Socio-demographic characteristics of respondents and their children in *Akaki Kaliti* sub-city, Addis Ababa Ethiopia, 2016.

Respondent characteristics	Categories	Frequency	Percent
<b>Gender</b>	Male	38	9.0
	Female	384	91.0
<b>Age in years</b>	15-30	207	49.1
	31-40	210	49.8
	41-50	5	1.2
<b>Residence</b>	Rural	7	1.7
	Urban	415	98.3
<b>Formal Education</b>	No	156	37.0
	Yes	266	63.0
<b>Employed</b>	No	187	44.3
	Yes	235	55.7
<b>Marital status</b>	Never married	50	11.8
	Married	372	88.2
<b>Number of children</b>	1-2	222	52.6
	3-4	132	31.3
	5-6	45	10.7
	>6	23	5.5
<b>Child sex</b>	Male	204	48.3
	Female	218	51.7
<b>Age of child in months</b>	0-6	65	15.4
	7-23	214	50.7
	24-59	143	33.9

associated with participant education, governmental recommendation of home fluid to the child during diarrhea, frequency of food feeding, types of withheld food or fluid, source of information on zinc, caregiver first choice of treatment to a child with diarrhea, reason for not giving full dose of zinc, duration of diarrhea stopped after taking zinc and caregivers recommending zinc therapy. Nonetheless, after adjusting for the confounding effect of the above variable, only reason for caregivers not giving full dose of zinc, duration of diarrhea stopped after taking zinc therapy, and caregivers recommending zinc therapy remained significantly associated with utilization of zinc bundle with ORS.

Those caregivers who stopped giving full dose of zinc after diarrhea stopped were more likely (AOR=10.29; 95% CI=2.52-42.05) to use zinc while those whose child diarrhea stopped after six days (AOR=0.09; 95% CI=0.02-0.45) and had mucoid diarrhea (AOR=0.32; 95% CI=0.10-0.97) were less likely to give zinc for their children than the referent groups.

## DISCUSSION

This study has examined the utilization of zinc bundled with ORS and its determinants. Based on our findings

**Table 2.** Participants' response on Zinc utilization related items in *Akaki Kaliti* sub-city, Addis Ababa Ethiopia, 2016.

Care givers characters	Category	Frequency	Percent
<b>Heard about zinc tablets</b>	Yes	422	100.0
	Radio	86	20.4
<b>Source of information on zinc</b>	Television	214	50.7
	Health workers	122	28.9
	Antibiotic syrup	123	29.1
<b>First choice of treating child with diarrhea</b>	Anti-motility syrup	135	32.0
	Zinc tab	57	13.5
	Antispasmodic syrup	107	25.4
	Government Hospital	67	16.0
<b>First treatment seeking</b>	Government health center	309	73.0
	Private clinic	46	11.0
	Private clinic	54	19.1
<b>Source of zinc tablet</b>	Private pharmacy	229	80.9
	Dilute with water	229	80.9
<b>Mix zinc tablet</b>	Dilute with ORS	54	19.1
	Until diarrhea stop	81	28.6
<b>Duration of zinc supplement</b>	For 7 days	148	52.3
	For 10-14 days	54	19.1
	Unpleasant taste of zinc	64	15.2%
<b>Reason for not giving full dose of zinc</b>	Vomiting	52	12.3%
	Diarrhea stopped	113	26.8%
	Had no reasons	193	45.7%
	Did not know where to obtain it	57	41.0
<b>Reasons for not giving zinc</b>	Unsure how to administered it	29	20.9
	Expensive	53	38.1
	After 1-3 days	216	76.3
<b>Duration of diarrhea after zinc supplement</b>	After 4-6 days	56	19.8
	>6 days	11	3.9
	Watery diarrhea	212	74.9
<b>Recommended zinc for</b>	Mucus /bloody diarrhea	34	12.0
	During teething	37	13.1
	Yes	256	90.5
<b>Satisfied with zinc treatment</b>	Don't know	27	9.5

utilization of zinc bundled with ORS as recommended by WHO and UNICEF(2004) is 67.1%. Compared with some previous studies done elsewhere, the current zinc

bundled with ORS use is higher than what has been reported for Nigeria (67.1% vs. 8.3%)(George et al.,2013) and comparable to the Kenyan findings (67.1% vs. 67%)

**Table 3.** Univariate and multivariate analysis for predictors of zinc and ORS utilization in *Akaki Kality*, Addis Ababa, Ethiopia, 2016.

Characteristics	Zinc bundle and ORS utilized		COR	AOR
	No	Yes		
<b>Formal education</b>	<b>n (%)</b>	<b>n (%)</b>		
No	64(41.0)	92(59.0)	1	1
Yes	75(28.2)	191(71.8)	1.77(1.16-2.69)*	1.29(0.51-3.21)
<b>Government recommended home fluid given to the child since diarrhea started</b>				
More	45 (27.1)	121 (72.9)	1	1
Same as usual	64 (42.1)	88 (57.9)	0.51(0.32-0.82)*	0.45(0.16-1.28)
Much less	30 (28.8)	74 (71.2)	0.92(0.53-1.58)	1.14(0.39-3.31)
<b>Frequency of feeding</b>				
More	41(25.2)	122(74.8)	1	1
Same as usual	98(37.8)	161(62.2)	0.55(0.36-0.85)*	2.48(0.96-6.47)
<b>Types of withheld food or fluid</b>				
Cereal gruel	3(15.0)	17 (85.0)	1	1
Cow's milk	5(33.3)	10 (66.7)	0.35(0.07-1.80)	17.94(0.00)
Any soup	4(66.7)	2 (33.3)	0.09(0.01-0.72)*	1.21(0.00)
<b>Source of information on zinc</b>				
Radio	35 (40.7)	51(59.3)	1	1
Television	59(27.6)	155(72.4)	1.8(1.07-3.05)*	0.00(0.00)
Health care provider	27(31.0)	60(69.0)	1.5(0.82-2.85)	0.00(0.00)
Health extension worker	18(51.4)	17(48.6)	0.7(0.29-1.43)	0.00(0.00)
<b>Care giver first choice of treatment to a child with diarrhea</b>				
Antibiotic syrup	44(35.8)	79(64.2)	1	1
Anti-motility syrup	54(40.0)	81(60.0)	0.84(0.5-1.4)	0.84(0.28-2.47)
Zinc tab	9(15.8)	48(84.2)	2.97(1.30-6.60)*	1.06(0.28-3.96)
Unknown pill or syrup	32(29.9)	75(70.1)	1.3(0.75-2.30)	1.22(0.40-3.68)
<b>Reason for not administering full dose of zinc</b>				
Unpleasant taste	12(18.8)	52(81.2)	5.99(3.01-11.94)*	1.63(0.59-4.49)
Vomiting	10(19.2)	42(80.8)	5.81(2.75-12.25)*	0.95(0.31-2.92)
The diarrhea stopped	5(4.4)	108(95.6)	29.87(11.65-76.54)*	10.29(2.52-42.05)*
Don't know	112(58.0)	81(42.0)	1	1
<b>Duration of diarrhea stopped after taking zinc</b>				
After 1-3 days	21(9.7)	195(90.3)	1	1
After 4-6 days	10(17.9)	46(82.1)	0.50(0.22-1.10)	0.82(0.29-2.29)
Above 6 days	6(54.5)	5(45.5)	0.09(0.03-0.32)*	0.09(0.02-0.45) *
<b>Care giver recommended zinc</b>				
Watery diarrhea	19(9.0)	193(91.0)	1	1
Mucoid diarrhea	9(26.5)	25(73.5)	0.27(0.11-0.67)*	0.32(0.10-0.97)*
Teething	7(18.9)	30(81.1)	0.42(0.16-1.09)	0.64(0.22-1.91)

\*Showed associated variables ( $p < 0.05$ ).

(Alex–Hart, 2014). On the other hand, when the current findings is compared with the recent EDHS 2016, our result still appears to be two-folds (67.1% vs 33%)

(Central Statistical Agency [Ethiopia] and ICF International, 2016). This is likely due to seasonal variation and high occurrence of diarrhea in the study site

as well as other important factors such as respondents' health seeking behavior during diarrhea episode. Even though zinc bundled with ORS utilization was associated with various socio-demographic characters and other health related variables only withholding to administer the full dose, stop giving the drug when the child feels better or his bowel habits improve and recommending zinc therapy were the determinants. Such information are however, limited in our settings and could not compare and contrast with other studies warranting further studies.

In spite of the unavailability of the zinc supplement at government health facilities, all caretakers whose child suffered diarrhea and prescribed zinc in the health centers bought the commodity from private clinic and private pharmacy indicating that the new diarrheal management initiative is acknowledged by the respondents similar to that of Kenyan study (Alex-Hart, 2014).

In terms of awareness of the commodity, all participants heard about zinc supplement and their major source of information was through television. This observation would pave the way for scaling up of the commodity in the community and highlights the need to avail the commodity within the public facilities, private health systems and community level if we are to end the burden of diarrhea and improve child survival. While this finding is encouraging, there were also some unhealthy experiences noted in this study where respondents ranked anti-motility and antibiotic treatment as their first choice to treat and needs some remedial action through an appropriate behavioral change communication diarrhea and bring some attitudinal changes towards the use of the right treatment for child diarrhea such as the use of zinc and ORS.

The extent of zinc treatment practices, the majority diluted in water and most of them used the supplement for seven days and few others provided the full dose for 10 – 14 days. This finding however, when compared with the Bangladesh figure (Larson et al., 2011), is lower (12.8% vs. 19.7%). The discrepancy could be attributed to the difference in caregiver's knowledge. Although, the observed zinc dose administered is good, zinc still promotional activities through other non-health avenues like mass media and is essential to adhere with the proper dose of treatment in order to reduce diarrhea related morbidities.

In the present study, it appears that considerable number of respondents used the zinc supplement, and close to one-third of them however, did not because of unawareness, unsure of how to administer zinc and its cost. This calls for more advocacy work through continuous reinforcing of health information for health workers to ensure accuracy and consistency in the health messages that they communicate at the health facilities when treating diarrhea. Other approach is to use non health avenues such as media which this study and the

Nepal finding have shown (Wang et al., 2011) that media is an important source of information to increase awareness. The other interesting findings of this study is that the vast majority was satisfied with the commodity and recommended zinc for diarrhea suggesting a fertile ground to scale up the commodity in the community; our study is concordant with the study done in Kenya where all caregivers stated that zinc is used for diarrhea (Alex-Hart, 2014).

Although zinc utilization was crudely associated with participant education, governmental recommendation of home fluid to the child during diarrhea, frequency of food feeding, types of withheld food or fluid, source of information on zinc, caregiver first choice of treatment to a child with diarrhea, reason for not giving full dose of zinc, duration of diarrhea stopped after taking zinc and caregivers recommending zinc therapy, only reason for caregivers not giving full dose of zinc, duration of diarrhea stopped after taking zinc therapy, and caregivers recommending zinc therapy remained significantly associated with utilization of zinc bundle with ORS. Those caregivers who stopped giving full dose of zinc after diarrhea stopped were more likely to uses zinc while those whose child diarrhea stopped after six days and had mucoid diarrhea were less likely to give their children the zinc.

It is interesting to note that full dose of zinc had never been administered in this study because since diarrhea stopped and most of the diarrhea cases took six days duration. In addition, respondents who recommended the bundled with ORS uptake of the commodity for mucoid diarrhea and teething were less likely to use the supplement than those who recommended for watery diarrhea.

### Strengths and limitations

The study was community based, used primary data with 100% response rate and minimized bias due to the wide variety of potential predictors which were controlled during analysis, including those that have never been examined in association with zinc utilization is the strength of the study. Nonetheless, mothers' self-report of both the dependent and independent variables may have resulted in information bias. Other than this, the cross-sectional nature of the data we cannot infer causal relationships.

### Conclusion

Slightly over two in three children used the commodity and the major augmenting factors for the zinc bundled with ORS uptake were withholding to administer the full dose, stop giving the drug when the child feels better or

his bowel habits improve and recommending zinc therapy.

## RECOMMENDATION

Given the unavailability of the commodity at government facility, it is thus essential to consider to avail the commodity in all public facilities to reinforce the new treatment of diarrheal initiative in order to improve child survival. It is also essential to establish an opportunity to raise awareness and improve practice related to the treatment of diarrhea with zinc and ORS as there were some misconceptions and low awareness on the zinc bundle administration. Other than this, providing free zinc to children whose mothers have low levels of social support, and considering refreshing trainings on diarrheal management may result in meaningful improvements in the zinc bundled with ORS uptake of the commodity.

## CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

## ABBREVIATIONS

**AOR:** Adjusted odds ratio; **COR:** crude odds ratio; **EDHS:** Ethiopian Demographic Health Survey; **FMOH:** Federal Ministry of Health; **HW:** Health Workers; **IYC:** infant and young children; **SPSS:** Statistical Package for Social Science; **UNICEF:** United Nations Children's Fund; **WHO:** World Health Organization.

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