

## Assessment of Socioeconomic status and the Prevalence of Tungiasis in Jimma and Wolaita sodo, Ethiopia

Suresh Kumar. P. Nair \*<sup>1</sup>, Zelalem .T. L <sup>1</sup>, Tsehayneh. K <sup>1</sup>, Mehidi. K <sup>1</sup>, Vidhya Ramaswamy V <sup>2</sup>.

<sup>1</sup> Department of Biomedical Sciences, College of Public Health and Medical Sciences, JIMMA University, Ethiopia.

<sup>2</sup> INCITE, Sri Rams, N. H. Road, Kazhakuttom, Trivandrum- 695 582, Kerala, India.

### ABSTRACT

**Background:** Morbidity profile of parasitic diseases reflects the socioeconomic conditions of a population. This study was conducted to reveal the socio-economic status and prevalence of tungiasis in different villages of south and south western Ethiopia. Tungiasis is a parasitic skin disease caused by a flea called *Tunga penetrans* and is endemic in Latin American and Sub-Saharan African countries.

**Aim:** To study the socioeconomic presentations and prevalence of tungiasis in rural and urban settings of different villages of Ethiopia.

**Methods:** A cross-sectional study was conducted among randomly selected people, using a standard questionnaire with interview and clinical evaluation. The team visited the selected subjects and studied the socio-economic issues and affecting the prevalence of *Tungiasis*.

**Results:** 2676 subjects were studied. Response rate was 100%. The prevalence of tungiasis was 15.15% in Jimma and 23.9% in Wolaita sodo. High prevalence of *tungiasis* could be significantly associated with the low income, poor housing and low standard living conditions and poor health care behavior of the population (p value <0.001).

**Conclusions:** This study elicits the link between low socioeconomic conditions of the population with high prevalence of the disease in the communities studied.

**KEY WORDS:** Tungiasis, Inflammation, Erythemic, Desquamation, Parasitic disease.

**Address for correspondence:** Dr. Suresh Kumar. P. Nair, Department of Biomedical Sciences, College of Public Health and Medical Sciences, JIMMA University, Ethiopia.

**E-Mail:** [sureshkumarpnair@gmail.com](mailto:sureshkumarpnair@gmail.com)

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### INTRODUCTION

*Tungiasis* or *mujali* is a parasitic disease of skin caused by a female flea *Tunga penetrans*. This ectoparasitic skin disease was endemic in economically backward communities of South America and Africa [1-3]. Gonzalo Fernandez de Oviels in 1526 reported first time and was followed by European travelers in South American population [2,4]. This disease came

to Africa probably in 1873 [1,5]. Symptoms of the disease are inflammation of the skin at the area of entrance of the flea, followed by severe itching with a black dot at the centre and a white space around the black dot often accompanied by severe pain. The hyper growth of the flea results in desquamation of the epithelium. The removal of the flea using thorns or unsterilized needle may results in infections in the area (Plate VI).

**Plate I:** Tungiasis lesions with egg.



**Plate II:** Tungiasis lesions in the foot.



**Plate III:** Deformed nails due to tungiasis.



**Photo IV:** Deformed nails of a two year old child.



**Plate V:** Tungiasis affected foot.



**Plate VI:** Tungiasis all over the foot.



This disease affects human and animals [6-8]. As this disease affects both human and animal, close contact of the animals increases the chance of infection [8,9]. *Tunga penetrans* complete its life cycle in the sandy or muddy floor of the houses and its premises. So poor houses with muddy or sandy soil, unhygienic health behavior of the population, all these factors affects the rate of infection [10-12]. Previous studies revealed that there were high prevalence of disease in sheep, dog and pig [8,13,14].

*Tunga penetrans* penetrate in to the skin and within 24 hours cause severe pain and within 2,3 days the afflicted area become inflammatory and erythemic with severe itching. Female flea only need animal or human host and within 8 to 12 days it become adult and hypertrophied. Plate-II shows the hypertrophied area of infection. Fleas get accommodated within the host body for 4 to 5 weeks and produce around 200 eggs [3,15,16]. Plate-I shows tungiasis lesions with eggs. Hyper growth of the flea results in irritation and cause redness and desquamation of the epithelium. Plate V and VI shows multiple sites of infection. Some times *Tunga penetrans* cause severe infection with multiple sites even exceeds 100. Plate III and IV shows deformed nails. Multiple lesions of toes may lead to deformation and auto amputation.

## MATERIALS AND METHODS

This study was conducted among two separate Districts of Ethiopia, Wolaita sodo and Jimma, situated far apart each other and one is in the southern region of Ethiopia and other in south western region of Ethiopia. Jimma is the largest city in south west of Ethiopia. Located in the Jimma Zone of the Oromia region, the city has a latitude and longitude of 704°N 36° 50' E. It is 356 kms far from Addis Ababa and has an altitude of 1760 meters above the sea level with mean annual rain fall of 17 mm throughout the year and the annual temperature range is between 10°C -30°C. Wolaita sodo is 390 Kms away from the capital Addis Ababa, Southern part of Ethiopia. Wolaita sodo is located at latitude of 80° 50'N and longitude of 37° 51' 45'E. The altitude ranges from 1100-2500 m.a.s.l. This is one of the 13 zones in Southern Ethiopia. Some part of Wolaita sodo is situated in the rift valley and temperature varies from 20 to 42 degree centigrade.

A cross sectional study was conducted in different kebeles of these districts. The kebeles were selected by lottery method. All kebeles included in the study were located in high altitude except one kebele in Wolaita sodo, the Bedeso kebele which was located in a rift valley. The sample size of the study population was

calculated using the formula  $n = \frac{Nz^2Pq}{d^2(N-1)+z^2Pq}$ . From each kebele study subjects were selected randomly. Four kebeles from Wolaita sodo and four kebeles from jimma were selected by lottery method. The studied kebeles of Wolaita sodo were Delbo, Sora koyo (Bedessa), Gola and Hebre. Delbo, Sora koyo (Bedessa) represents Wolaita rural. Gola kebele and Hebre represents Wolaita sodo urban. Almeyehumecha and Bulbul belongs to Jimma rural. Bosa addis and Bosa kito were belongs to Jimma urban.

A stratified random sampling technique was adopted for kebeles with high population density. All households were selected from each kebele and a list of households in the kebele was prepared and a sample size of minimum 305 was selected by simple random sampling by using computer software. A standard questionnaire was developed using WHO questionnaire. Data was collected using the standard questionnaire by interviewing the selected subjects with clinical checkup. The base line characters and life style of the study population were studied. Participants or the parents of the participants ready to cooperate were clearly informed the importance of the study. Only those permanently inhabited in these places, between the age of 1 year to 75 and ready to sign the consent were included. People occasionally visiting other areas were excluded. The selected individual's clinical evaluation was conducted to reveal the severity of the infection [10].

The data collected were entered in computer daily and data were analyzed using frequency distribution, Fisher's exact test and Pearson Chi - square using SPSS version-20. Data is interpreted at 95% level of confidence. Ethical clearance was obtained from the Jimma University Ethical Committee.

## RESULTS

This study covered households with a total population of 2676 distributed in eight different kebeles of two distant areas, Wolaita sodo situated in the southern part of Ethiopia and Jimma located in the south western part of Ethiopia. All kebeles included in this study were located in high altitude except one kebele in Wolaita sodo, the Bedeso kebele which is

located in a rift valley. The studied community had a total population of 2676, out of which 1407(52.58%) were female and 1269 were male (47.42%). Annual income of the population is very low. In Wolaita sodo 97.28% of the population, annual income was only below 200 US dollar. In Jimma it was 90.25%. This show that study population were economically backward. Literacy status of the rural communities of both Jimma and Wolaita sodo were very low. In Wolaita 43.34% houses and in Jimma 58.64% houses were kacha type with sandy or muddy floorings. Many of the semi pucca houses were with sandy or muddy floorings. In Wolaita 88.88% houses were with muddy or sandy floorings, whereas in Jimma it was 68.54%. Many of the houses were not electrified. Majority of the study groups were using foot wear.

In Wolaita sodo 23.9% were tungiasis positive where as in Jimma it was 15.1%. Rural kebele shows a high prevalence of tungiasis compared to urban kebeles. Rift valley shows a low prevalence of tungiasis compared to high altitude population.

**Table 1:** Baseline characters of the population.

Variable	Wolaita sodo n=1322		Jimma n=1354	
	n	%	n	%
<b>Sex</b>				
Male	621	46.97	648	47.85
Female	701	53.02	706	52.14
<b>Literacy</b>				
Illiterate	584	44.18	527	38.92
Read only	82	6.2	18	1.33
01-Jun	508	38.43	560	41.36
07-Dec	144	10.89	216	15.95
>12	4	0.3	33	2.44
<b>House type</b>				
Kacha	573	43.34	794	58.64
Semi pucca	741	56.05	539	39.81
Pucca	8	0.61	21	1.56
<b>Floor type</b>				
Sandy/muddy	1175	88.88	928	68.54
Cemented	147	11.12	417	30.78
<b>Electrification</b>				
Electrified	639	48.34	858	63.37
Not electrified	683	51.66	496	36.63
<b>Annual income</b>				
<200\$	1286	97.28	1222	90.25
201-500\$	36	2.72	127	9.38
501-1000\$	0	0	5	0.37
>1001\$	0	0	0	0
<b>Footwear</b>				
Using	991	74.96	1243	91.8
Not using	331	25.04	111	8.2

**Table 2:** Shows the comparison of the prevalence of tungiasis in different study area.

Area	n	tungiasis			Chi square	p value
		Neg	pos	%		
Wolaita	1300	989	311	23.9	32.61	0.001***
Jimma	1342	1139	203	15.1		
Jimma rural	664	503	161	24.2	85.15	0.001***
Jimma urban	678	636	42	6.2		
Wolaita rural	671	525	146	21.8	3.57	0.058
Wolaita urban	629	464	165	26.2		
High altitude	419	278	141	33.7	92.69	0.001***
Rift valley	252	247	5	2		

**Table 3:** Shows the association between socio-economic status and tungiasis.

variables	Total subjects n=2676		Chi square	P value
	Tungiasis			
	neg	pos		
<b>Sex</b>				
Male	1010	259	2.247	0.134
Female	1152	255		
<b>Literacy</b>				
Illiterate	892	219	34.323	*0.001
Read and write	75	25		
Gr 1-6	835	233		
Gr7-12	323	37		
Above 12	37	0		
<b>Income in US dollars</b>				
Below 200 per annum	2003	505	22.255	*0.001
201-500	154	9		
501-1000	5	0		
Above 1000	0	0		
<b>House type</b>				
Kacha	1062	305	17.578	*0.001
Semi pucca	1076	204		
Pucca	24	5		
<b>Usage of foot wear</b>				
Yes	1820	414	4.645	0.81
No	342	100		

**DISCUSSION**

Many studies were conducted in Ethiopia on the prevalence of parasitic diseases with very little emphasis was put on the Epidemiology of tungiasis. In economically backward communities with low socio-economic conditions tungiasis exists as a health problem [1]. This data revealed that the kebeles studied were below the poverty line with inadequate housing and there existed unhygienic life style with inadequate health management. This study shows that highly significant association exist between the prevalence of tungiasis, poor

housing and low economic status of the population (p value <0.001). The illiteracy of the studied areas played a significant role in the occurrence of the disease (p value <0.001). The literacy rate of the rural kebeles studied was very poor with 44.18% illiterates in Wolaita and 38.9% illiterate people in Jimma. Most of the houses were of kacha or semipucca type with muddy or sandy floorings. The inadequate health care and unhygienic behavior of the population also contributed a significant role in the spreading of the disease [9,12]. Close contact with the animals also an important factor in the high prevalence of this disease in the studied area (8). The improper use of foot wear may be one of the reasons for tungiasis infection in this population coupled with lack of appropriate care. This study couldn't reveal the association between usage of foot wear and occurrence of the disease [6,15].

This data reveals that the studied population showed high prevalence of tungiasis. Previous studies indicate that similar to other parasitic diseases, occurrence of severe tungiasis is linked to poverty [15,17]. This study shows that the poor communities of studied kebeles of Wolaita and Jimma were like that of Brazil, Trinidad and Nigeria, where there is high prevalence of tungiasis that is 16% to 54%) [18,19].

This study covered a total population of 2676 distributed in eight different kebeles of two distant areas, Wolaita sodo situated in the southern part of Ethiopia and Jimma located in the south western part of Ethiopia. This study also revealed that the occurrence of the disease was closely associated with low economic

conditions, illiteracy and unhygienic health practices of the community. The study indicates that there was high prevalence of tungiasis among children and elderly. This might be due to poor housing, animal contact, negligence and carelessness. Various statistical data reveals that the study population was below the poverty line.

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