

ORIGINAL ARTICLE**Determinants of Podoconiosis, a Case Control Study****Berhanu Elfu Feleke^{1*}****OPEN ACCESS**

Citation: Berhanu Elfu. Determinants of Podoconiosis: A Case Control Study. J Health Sci.2017;27(5):501. doi:<http://dx.doi.org/10.4314/ejhs.v27i5.8>

Received: April 3, 2017

Accepted: May 18, 2017

Published: September 1, 2017

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Funding: Nil.

Competing Interests: The authors declare that this manuscript was approved by all authors in its form and that no competing interest exists.

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ABSTRACT

BACKGROUND: Podoconiosis is a non-filarial swelling of lower extremity endemic in tropical regions, North America and India. The etiology and pathophysiology of the disease remain unknown. The objective of this study was to identify the determinants of Podoconiosis.

METHODS: Unmatched case control study design was conducted. The sample size was calculated using Epi-info soft ware: 95% CI, 85% power, control to case ratio of 2:1, expected frequency of barefoot among controls 50%, odds ratio of 1.5 and non-response rate of 10% yielding 1148 study participants. Binary logistic regression was used to identify the determinants of Podoconiosis.

RESULTS: A total of 1113 study participants (379 cases and 734 controls) were included giving for a response rate of 96.95%. Positive family history (AOR, 2.81 [95% CI: 1.7-4.64]), bare foot (AOR, 3.26 [95% CI: 2.03-5.25]), poor foot hygiene (AOR, 2.68 [95% CI: 1.72 - 4.19]) increase the risk of Podoconiosis. Female gender (AOR, 0.26 [95% CI: 0.15-0.44]), good housing condition (AOR, 0.17 [95% CI: 0.1-0.3]), medium income (AOR, 0.12 [95% CI: 0.07- 0.22]) and primary education (AOR, 0.02 [95% CI: 0.01-0.04]) decrease the risk of Podoconiosis.

CONCLUSION: Podoconiosis control and prevention programmes should involve the low income and uneducated populations.

KEYWORDS: Podoconiosis, Determinants, Ethiopia

INTRODUCTION

Podoconiosis is a non-filarial swelling of lower extremity endemic in tropical regions, North America and India. Podoconiosis is a geographically localized disease prevalent in the highland areas. Patients with Podoconiosis manifest with bilateral and asymmetric swelling of lower extremity usually below the knee. The etiology and pathophysiology of the disease remain unknown. The World Health Organization has currently recognized the disease and included it in the list of neglected tropical conditions in endemic area (1-9). In Ethiopia, more than 11 million people are at risk of the disease, and more than one million people live with the disease (10-12). In endemic areas of the country, the prevalence of the disease ranges from 5% - 10% (1, 4), and there is no national policy to control and prevent the disease (3). Patients did not have any information

about the management of the disease, and they were neglected from the society. As the disease progresses, Podoconiosis patients became bedridden, isolated from the community activities (3, 13-19). All Podoconiosis patients did not perform their daily work properly; as a result of this, they had low income. Annually, Ethiopia losses more than 200 million USA dollars due to Podoconiosis (20-22).

Patients with Podoconiosis in west Gojam are usually treated in Durbetie Podoconiosis treatment center. In East Gojam, treatment and diagnosis of Podoconiosis was mainly performed at Debemarkose Podoconiosis treatment center.

Scholarly findings from different parts of the world suggested that Podoconiosis was associated with shoe wearing practice, age, exposure to clay soil, family history, gender, foot hygiene, farming occupation, poor housing condition, educational status, marital status and income level (1, 2, 10, 16, 22-30).

This research will act as an important input to identify the etiology of the disease for further experimental studies. High level decision makers and health professionals will get pertinent information regarding the determinants of the disease in their intervention against Podoconiosis control and prevention. The main objective of this study was to identify the determinants of Podoconiosis.

METHODS AND MATERIALS

A case control study design was conducted. The study was conducted in East and West Gojam zones. These zones are located in the Northern part of Ethiopia with a total population of 5,383,552 (31). The sample size was calculated using Epi-info software based on the assumption of 95% confidence interval, 85% power, control to case ratio of 2:1, expected frequency of bare foot among controls 50%, odds ratio to be detected as 1.5 and non-response rate of 10% yielding 765 controls and 383 cases (1148 study participants). Simple random sampling technique was used to select the cases using registration books of Durbetie and Debemarkose Podoconiosis treatment centers as a sampling frame. Only Podoconiosis patients diagnosed from January

2015 to March 2015 were included. Two control groups were included from the health facility and community. Simple random sampling technique was used to select the control from health institutions in East and West Gojam zones. One control group was selected from the community; this control was selected from nearby house of the cases. Simple random sampling technique was also used to select the control from the neighborhood of case.

Data were collected using interviewer administered questionnaire. Data were collected by clinical nurse. The whole data collection process was supervised by health officers. Steps were taken to insure the quality of this work. Pretest was conducted on 50 study participants and necessary corrections were made on the questionnaire. Training was given for the data collectors and supervisors, and the whole data collection process was closely supervised. Data were entered into the computer using Epi-info software and transferred to SPSS for analysis. Binary logistic regression was used to identify the determinants of Podoconiosis. Adjusted odds ratio with their 95% CI was used to identify the determinants of Podoconiosis.

Standard housing condition was measured if they were living in the absence of overcrowding (no more than 3 persons living in two rooms), if the house gets proper natural lighting and ventilation, if the floor was constructed from cement, wood or ceramics, if domestic's animals were living in separate rooms and if a separate kitchen is constructed separately. If all these criteria were fulfilled, then the house will be declared as standard housing.

Proper foot hygiene was measured, if patient daily wash their foot with soap and if they apply lotion after proper cleaning of their foot.

Ethical clearance was obtained from Bahir Dar University College of Medicine and Health Sciences Ethical Review Committee. Legal permission was obtained from Amhara National Regional State Health Bureau Ethical Review Committee. Written informed consent was obtained from each study participant. Study participants' right to withdraw from the study at

any points was respected. The confidentiality of the data at any point was maintained.

RESULTS

A total of 1113 study participants were included, making a response rate of 96.95%. The mean age of the study participants was 33.82 years (SD 7.37 years). Around 96% of the study participants were orthodox Christians. Almost half (48.50%) of the participants were farmers by occupation.

Profile of cases: A total of 379 Podoconiosis patients were included. The mean age of the cases was 39.84 years (SD=9.01 years). Female constitute 68.30% of cases, 56.70 % of cases had family history of Podoconiosis, the proportion of bare foot among cases was 53 and 67.80% of cases were illiterate.

Profile of controls: A total of 734 controls were included, giving a response rate of 95.94%. The mean age of controls was 30.72 years (SD 3.43 years). Positive family history of Podoconiosis was recorded in 11.4% of controls. The proportion of bare foot among controls was 52.50%. Female constitute 44% of controls. Farmer occupation constitutes 52.7 % of controls.

Adjustment was done for residence, bare foot, gender, educational status, family history of Podoconiosis, poor housing condition, foot hygiene, income and occupation. Podoconiosis was associated with positive family history of Podoconiosis, bare foot, gender, poor housing condition, foot hygiene, income and educational status of individual (Table 1).

Table 1: determinants of Podoconiosis in east and west Gojam zones (n=1113).

<i>Variables</i>		<i>Case</i>	<i>Control</i>	<i>COR [95% CI]</i>	<i>AOR [95% CI]</i>	<i>p-value</i>
<i>Family history</i>	Yes	164	84	5.06 [3.70 - 6.91]	2.81 [1.70-4.64]	<0.01
	No	251	650	Reference	Reference	
<i>Bare foot</i>	Yes	178	385	0.80 [0.62-1.04]	3.26 [2.03-5.25]	<0.01
	No	201	349	Reference	Reference	
<i>Sex</i>	Female	259	323	2.75 [2.10- 3.60]	0.26 [0.15-0.44]	<0.01
	Male	120	411	Reference	Reference	
<i>Housing condition</i>	Standard	67	247	0.42 [0.31-0.58]	0.17 [0.10-0.30]	<0.01
	Poor	312	487	Reference	Reference	
<i>Foot hygiene</i>	Poor	282	376	2.77 [2.09-3.67]	2.68 [1.72 - 4.19]	<0.01
	clean	97	358	Reference	Reference	
<i>Income</i>	Medium	27	392	0.09 [0.06-0.13]	0.12 [0.07-0.22]	<0.01
	Low	352	442	Reference	Reference	
<i>Educational status</i>	Tertiary	20	225	0.01 [0.00-0.01]	0.003 [0.001-0.007]	<0.01
	Secondary	50	255	0.02 [0.01-0.03]	0.01 [0.005-0.02]	<0.01
	Primary	52	231	0.02 [0.01-0.03]	0.02 [0.01-0.04]	<0.01
	Illiterate	257	23	Reference	Reference	

The odds of Podoconiosis was 2.81 times higher with family history of the disease (AOR 2.81: 95% CI 1.7-4.64). The odds of Podoconiosis was 3.26 times higher in bare footed persons (AOR 3.26: 95% CI 2.03-5.25). The odds of Podoconiosis was 74% lower in females (AOR 0.26: 95% CI 0.15-0.44). The odds of

Podoconiosis was 83% lower among persons living in standard housing condition (AOR 0.17: 95% CI 0.1-0.3). Poor foot hygiene increases the risk of Podoconiosis by 2.68 folds (AOR 2.68: 95% CI 1.72 - 4.19). The odd of Podoconiosis was 88% higher among people with low monthly income (AOR 0.12 95% CI: 0.07-0.22).

DISCUSSION

The mean age of the cases was 39.84 years while the mean age of controls was 30.72 years (the cases were 9 years older than the controls). Around 70.40% of the cases were from rural areas signaling that the disease was clustered in the rural areas. Podoconiosis patients were isolated from the community; 58% of cases were single even if they were 9 years older than the control whereas 92.2 % of the controls were married even if they were 9 years younger than cases.

Individuals with family history of Podoconiosis were 2.81 times more likely to develop Podoconiosis than individuals with no family history of Podoconiosis (AOR, 2.81 [95% CI: 1.7-4.64]). This finding agrees with previous finding (32). This might be due to the effect of genes in the development of Podoconiosis (2)

The odds of Podoconiosis in barefooted an individual was 3.26 times higher than in individual who wear shoe in their daily activities (AOR, 3.26 [95% CI: 2.03-5.25]). This finding agrees with scholarly findings from different parts of the world (1, 2, 18, 26). This might be due to the reason that barefooted individuals may allow substances to enter in to their body that can possibly initiate the pathophysiology of the disease.

The odd of Podoconiosis was 3.85 times higher in the male gender. This finding is different from other scholarly findings (32, 33). This might be due to the different exposure distribution of predictors of Podoconiosis in these areas.

The risk of acquiring Podoconiosis in an individual living in poor housing conditions was 83 % higher (AOR, 0.17 [95% CI: 0.1-0.3]). This finding agrees with other findings (34). This might suggest the possibility of environmental factors associated with poor housing in the development of Podoconiosis.

The odds of Podoconiosis in an individual who did not frequently keep his/her foot hygiene was 2.68 times higher than with an individual that keep his/her foot hygiene in their daily life (AOR, 2.68 [95 CI: 1.72 - 4.19]). This finding agrees with a 2012 finding from Central Ethiopia (1). This might be due to the reason that keeping foot

hygiene will detach the possible provoking agent away from susceptible hosts.

The odds of Podoconiosis was 88 % higher in an individual with low income (AOR, 0.12 [95% CI: 0.07- 0.22]). This signals that Podoconiosis was affecting the poor and the powerless. This might be due to the reason that the poor were most likely living in poor housing conditions and that they were most likely barefooted.

As compared to the illiterate, the odds of Podoconiosis was 98% lower with primary education (AOR, 0.02 [95% CI: 0.01-0.04]), 99% lower for secondary education (AOR, 0.01 [95% CI: 0.005-0.02]) and tertiary education decreased the risk of Podoconiosis by 99.97% (AOR, 0.003 [95% CI: 0.001-0.007]). This finding agrees with a 2013 finding from East Gojam (30). This might be due to the fact that educational status increases awareness on foot hygiene.

High level decision makers in the area of health should plan modalities to enhance the shoe-wearing behaviors of the communities. Podoconiosis control and prevention programmes should involve the low income and uneducated populations. Scholars should test the effect of all these variables with further longitudinal studies.

The main limitation of this study is recall bias. To decrease the effect of this bias, incident cases were included and probing technique was implemented by interviewers. In conclusion, the risk of developing Podoconiosis was affected by shoe-wearing practice, gender, foot hygiene, poor housing condition, educational status, low income and family history of Podoconiosis.

ACKNOWLEDGEMENTS

I would like to acknowledge the Amhara national regional state health bureau for their unreserved support during this work. I would also like to acknowledge Durbetie Podoconiosis treatment center and Debemarkose Podoconiosis treatment center. At last but not least I would like to acknowledge all institutions and organization that had input for this work.

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