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Research Article

Knowledge and Associated Factors of House and Environment Hygiene among Household Mothers in Maksegnit District, Central Gondar Zone, Northwest Ethiopia: A Community-Based Cross-Sectional Study

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Abstract

Background: A significant proportion of diseases are communicable globally, with over 60% being linked to poor hygiene knowledge. The global problem of improved hygiene access has been exacerbated by a knowledge gap. Therefore, the aim of this study is to assess knowledge and associated factors of house and environment hygiene among mothers in Maksegnit District, Northwest Ethiopia, 2022.

Methods: A community-based cross-sectional study was conducted among 634 mothers. Systematically selected mothers in the Maksegnit District from 1 May, to 15 June 2022. Data were collected by trained data collectors via interview using a validated structured questionnaire and through observation of housing conditions. Data entry were done using Epi-Data version 4.6 and was exported to SPSS version 23 for further analysis. Bivariable and multivariable logistic regression models were done. An adjusted odds ratio with a 95% confidence interval was used to identify factors associated with level of good knowledge hygiene.

Results: Among 634 participants, 100% response rate. Of the total study participants, 459 (72.39%) mothers had good hygiene knowledge. In this study, urban dwellers' access to media (AOR: 1.61; 95% CI [1.04, 2.49]), the absence of flies in the house (AOR: 1.77; 95% CI: [1.08, 2.91]), food preparation in a separate room (AOR: 1.89; 95% CI: [1.13, 3.18]), food preparation outside in an open space to the main house (AOR: 4.72; 95% CI: [1.66, 13.56]) and participants who had a favorable level of attitude (AOR: 2.69; 95% CI: [1.33 - 2.82]) were significantly associated with knowledge of house and environment hygiene among household mothers.

Conclusion: In this study, the level of good hygiene knowledge is relatively low. As a result, interventions that would address the above-mentioned factors need to be implemented.

Keywords: *Knowledge; Hygiene; Predictors; Mothers; Ethiopia*

Abbreviations

AOR: Adjusted Odds Ratio; COR: Crude Odds Ratio; DALYs: Disability Adjusted Life Years; NTDs: Neglected Tropical Diseases; SPSS: Statistical Package for Social Sciences; WHO: World Health Organization

Introduction

According to the World Health Organization, hygiene is "the process of cleaning an environment of all sickness factors that may cause health problems, including all precautions to be taken to reduce microorganisms" [1]. Making hygienic environments are important parts of breaking the fecal-oral transmission route for many illnesses [2]. Improved hygiene facilities refer to using clean and safe water in facilities that can effectively prevent human, animal, and insect contact with excreta [3]. It ranges from simple but protected pit latrines to flush toilets with a sewerage connection [4]. Provision of universal access to improved hygiene at the household level plays an important role in the reduction of diarrheal diseases and helminthes infections and hence improves the psychosocial well-being of the users [5].

Sustainable Development Goal 6.2 was designed to achieve access to adequate and equitable hygiene for all end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations [6]. Hygiene is the most critical aspect of preventing and controlling communicable diseases in developing countries like Ethiopia, where service access is very poor [7,8]. Even though there may be gaps in translating the actual knowledge and attitude into real practices, this may heavily influence people's hygiene practices [9].

Globally, 2.3 billion people still lacked basic hygiene, including 670 million with no hand-washing facility at all [10]. Similarly, 1.9 million deaths and 123 million disability-Adjusted Life-Years (DALYs) are associated with inadequate water and hygiene. The water hygiene -attributable disease burden amounts to 4.6% of global DALYs and 3.3% of global deaths [11]. A causal link between hand hygiene and rates of infectious disease illness has also been established earlier. Hand hygiene is any action of hand cleansing, i.e. cleaning one's hands with or without the use of water or another liquid or with the use of soap, for the purpose of removing soil, dirt, and/or microorganisms [11,12].

Improving water hygiene practices at the household mother level is the most effective intervention measure to prevent and control the burden of diarrhea and other communicable diseases. For instance, proper hand washing with soap, improved water quality, and proper excreta disposal can reduce diarrheal diseases by 48%, 17%, and 36%, respectively [13]. Despite, interventions and sustained efforts from a range of stakeholders in Ethiopia, still over 40,000 children morbidity and mortality in the country every year [14].

Socio-demographic factors such as good educational status, rural residence, and a low income status of the respondents' having a modern house type create favorable conditions; community health service workers, latrine ownership increased through financial assistance, resulting in improved privacy, social prestige, and a heightened sense of responsibility towards maintaining a healthy life; latrine and hand washing facilities; open defecation (OD); lack of access to latrine facilities [15-20].

Despite the fact that the availability of health extension workers to improve the level of community hygiene practice, poor hygiene is a common health problem, as the district health office reports annually [21]. This study is critical for providing credible evidence on hygiene knowledge and its associated factors.

Aim of the Study

This study aimed to assess knowledge and its associated factors of house and environment hygiene among household mothers in Maksegnit District, Northwest Ethiopia.

Materials and Methods

Study design and period

A community-based cross-sectional study was conducted from 1 May, to 15 June, 2022.

Study setting

The study was conducted in the Gondar Zuria District, Amhara regional state, Northwest Ethiopia. It is one of the 22 districts in the North Central Gondar Zone. It located 140 km northwest of Bahir Dar, the capital city of Amhara regional state, and 40 km southeast of Gondar. The district has seven health centers and 35 health posts. It has 70 health extension workers. According to the 2017/18 population projection, the total population of the district is 235,166, of which 31,841 are children under the age of five. The latrine and water coverage of the district are 14% and 63.8%, respectively. Diarrhea and parasitic infections of the upper respiratory tract are the main health problems of the general community [21].

Participants

All mothers in the district were considered the source population for the study, while all mothers in randomly selected kebeles at the time of the data collection period were considered the study population. All mothers who lived in the study area during the data collection period were included in this study, while all mothers who were seriously ill and unable to hear were excluded from the study during the data collection period.

Sample size determination

The sample size (n) was determined by using a single population proportion formula by considering the following statistical assumptions: From a previous study in the Tigray region, Northern Ethiopia, conducted to determine the level of knowledge and practice towards water, sanitation and hygiene (WASH), which reported 49.2% of mothers had good knowledge, towards WASH [22]; power (β= 80%) and a level of confidence (α= 95%) and a margin of error (d = 5%); $\mathbf{n} = \frac{(Z\alpha/2)^2 P(1-P)}{d^2} = \frac{(1.96)^2 0.49(1-0.49)}{(0.05)^2} = 384$.

The final sample size including the 1.5 design effect and the 10% non-response rate was 634 mothers. The sample size was also calculated using factors associated with knowledge and practice of hygiene by considering the following assumptions: two-sided confidence interval = 95%; power = 80%; ratio (unexposed to expose) = 1; the design effect (DE) was 1.5, and the non-response rate (NR) was 10% (Table 1).

Factors	% Outcome in unexposed	% Outcome in exposed	Odds ratio	Calculated sample size	Sample size+DE+NR	Reference
Hygiene attitude	40.75%	70%	3.39	102	169	[23]
Solid waste collection container witnessed	53.95%	34.17%	2.26	216	357	[23]
Open defecation	40.76%	23.16	2.28	242	400	[24]
Attitude on latrine use	36.68%	22.64%	1.98	358	590	[24]

Table 1: *Sample size calculation with determinants.*

Therefore, the sample size obtained by using the single population formula (634) is higher than the sample size calculated by using the second objective (using factors significantly associated with the outcome variable). Therefore, the minimum sample size to represent the study participants was 634.

Sampling technique

Two-stage sampling techniques were used to select the study participants. First, 10 kebeles (nearly 50% of the total of 21 kebeles in Maksegnit District) were selected using a simple random sampling technique (the lottery method). The sample size was proportionally allocated to each selected kebele based on the size of the population in the kebele. Household mothers were selected by a systematic random sampling technique. The sampling interval K^{th} value was calculated by dividing the total number of mothers in each kebele by the sample size allocation.

Data collection tool and procedure

The questionnaire was prepared by reviewing previous studies [25-27]. First, the English version was prepared, translated to Amharic, and then translated back to English by language experts. The questionnaire consists of four parts: socio-demographic, environmental health, knowledge toward hygiene and attitude toward hygiene. Five BSc degree holders in environmental health and one master degree holder in environmental health were recruited for the data collection process and as supervisors, respectively. Data were collected through an interview and direct observation using validated and pretested structured questionnaires.

Data quality management

A pre-test was done on 5 percent of the sample size (32 participants) in Koladiba District. The questions required modifications based on the pretest. Training was given to the data collectors before the actual data collection. The training covered the aim of the study, procedures, inclusion and exclusion criteria, data collection technique (going through the questionnaires one by one), the art of interviewing, a way of collecting the data, and clarification. The supervisor was checking on how the data collection was going on a daily basis. At the end of each day of data collection, the principal investigator also checked the completeness of each questionnaire. Every questionnaire was checked before data entry by the principal investigators. Study participants were clearly informed about the purpose and usefulness of the survey, thereby creating a friendly atmosphere to reduce their stress as the study touches on sensitive issues. The validity of the questionnaire, which is measured by its type of content validity, was acquired by the experts, and its reliability was established using the internal stability method (Cronbach's alpha coefficient). A multi-collinearity assumption was checked using the Variance Inflation Factor (VIF < 1.5). Model fitness was checked using the Hosmer-Lemeshow test which for knowledge was ($p = 0.422$).

Data processing and analysis

Data were validated, coded, and entered into Epi-data 4.6 before being exported to SPSS 23 for cleaning and analysis. Descriptive statistics were carried out and presented with narration and tabulation. Bivariate logistic regression analyses were carried out to identify independent predictor variables for the outcome variables. Multivariable logistic regression was used to generate the final fitted mode in order to identify variables that were significantly associated with knowledge of house and environment hygiene among households. Bivariable p-values of less than or equal to 0.25 were considered to be select candidate variables for multivariable logistic regression analysis. The odds ratio with a 95% confidence interval was used to determine the strength of association between the predictors and outcome variables. A p-value of 0.05 was considered adequate to declare statistical significance.

Variables and measurements

Knowledge towards house and environment hygiene was a dependent variable, while socio-demographic factors (age, ethnicity, religion, residence, marital status, and education status, occupation, family size, and access to media) and household and environmental

factors (availability of water, source of water, daily water consumption, availability of latrines, hand-washing facilities, household cleanliness, number of rooms, drinking water treatment, disposal of children's feces, cleaning of storage containers, community health services) and attitude were independent variables. Knowledge about of hygiene respondents was asked 12 knowledge questions (Cronbach's alpha 0.85) about their knowledge of hygiene of household mother about house and environment.

For each question; the participants were given 1 point for the correct answer and a zero (0) when the answers were incorrect. The responses were added, and the mean was computed. Those study participants who scored mean and above mean of the sum of the knowledge questions were considered as having good knowledge and otherwise they were labeled as having "poor knowledge" [22].

Attitude about house and environmental hygiene among household mothers were assessed by using 16 attitudinal questions (Cronbach's alpha 0.72) with a 5-scale Likert (1-strongly agree, 2-agree, 3-undecided/not applicable, 4-disagree and 5-strongly disagree dichotomized as 1 for strongly agree, agree and 0 for undecided/ not applicable, disagree and strongly disagree. Those study participants who scored mean and above mean of the attitude questions were considered as holding the as favorable attitude (> mean) or unfavorable attitude (< mean) [28].

Ethical approval and consent to participate: An approval letter was given from Gondar University's research and ethics committee (Ref. IPH/2274/2014). In addition, after explaining the importance of the study, permission letters were obtained from each of the kebeles/ ketenas administrators.

Informed consent statement: Verbal informed consent has been obtained from the patient(s) to publish this paper".

Results

Socio-demographic characteristics of participants

A total of 634 mothers participated in this study, with a response rate of 100%. The mean age of the study participants was 36.7 (± 9.9 SD). About 582 (91.8%) of the study participants were from the Amhara ethnic group. The majority of study participants, 393 (62%), were currently residing in urban areas. However, regarding the educational status of the study participants, only 63 (9.9%) of them attended secondary school or above. Furthermore, among the 634 total study participants, more than half (56.6%) do not get access to information about housing and environmental hygiene (Table 2).

Variables	Frequency	Percent (%)
Age groups		
18-26	87	13.7
27-35	234	36.9
36-44	185	29.2
45-70	128	20.2
Ethnicity		
Amhara	582	91.2
Tigray	52	8.2
Religion		
Orthodoxs	573	90.4
Muslim	56	8.8
Other	5	0.8

Mothers' marital status		
Current married	479	75.6
Single	155	24.4
Husbands' educational (n = 479)		
Unable to read write	171	35.7
Able to read write	230	48.0
Primary school	43	9.0
Secondary and above	35	7.3
Mothers' educational		
Unable to read write	387	61.0
Able to read write	145	22.9
Primary school	39	6.2
Secondary and above	63	9.9
Mothers' occupation		
Housewife	454	72.1
Civil servant	145	22.9
Merchant	32	5.0
Family size in number		
≤ 4	329	51.9
> 4	305	48.0
Place of residence		
Urban	393	62.0
Rural	241	38.0
Access to media		
Yes	378	56.6
No	256	40.4

Table 2*: The socio-demographic factors with respect to knowledge of housing and environment hygiene among mothers in Maksegnit District, Ethiopia, 2022.*

Other: Catholic and protestant.

Environmental related factors

Of the total 634 mothers, 368 (58%) had access to private latrines. Of these, only 119 (18.8%) mothers had latrines with hand washing facilities. Of this, only 67 (10.6%) functional hand washing facilities had water and soap during the data collection. Regarding access to a safe water supply, the majority of study participants-349 (55.0%) responds to get water from piped water sources. Furthermore, a higher proportion of mothers more than two-thirds of 464 (73.2%) got to the water within 30 minutes. Individual daily water consumption was 20 L/C/D for 522 (82.3%) of the study participants. In terms of water treatment, the majority of study participants (461, or 72.7%) did not treat water. In terms of waste disposal, nearly half of the study participants (50.5%) disposed of their waste in an open field (Table 3).

Variables	Knowledge		
Presence of latrine	**Good**	**Poor**	**Frequency**
Yes	275	93	368 (58.0)
No	184	82	266 (42.0)
Latrine present within 6 meters in household			
Yes	213	72	285 (77.4)
No	62	21	83 (22.6)
Hand wash facility near to latrine			
Yes	86	33	119 (18.8)
No	373	142	515 (81.2)
Water source			
Piped water	266	83	349 (55.0)
Protected well	47	26	73 (11.5)
Protected spring	116	46	162 (25.6)
Un protected well	7	4	11 (1.7)
Un protected spring	23	16	39 (6.2)
Long to take water			
≤ 30 minute	230	234	464 (73.2)
> 30 minute	129	41	170 (26.8)
Water treatment			
Yes	129	53	173 (27.3)
No	339	122	461 (72.7)
Water treatment option			
Chilorine /wuhaagar	123	52	175 (27.6)
Boiling	20	10	30 (4.7)
No usage treatment	316	113	429 (67.7)
Frequency of cleaning water storage			
Daily	66	26	92 (14.5)
Weekly	186	76	262 (41.3)
Monthly	47	14	61 (9.6)
When dirty	160	59	219 (34.5)
Reliability of water in a year			
Yes	235	80	315 (49.7)
No	224	95	3199 (50.3)
Amount of water used			
≥20 L/C/D	28	84	112 (17.7)
<20L/C/D	234	288	522 (82.3)
Waste disposal management			

Open field	221	99	320 (50.5)
In the pit	161	52	213 (33.6)
Burning near the yard	77	24	101 (15.9)
Have live stock			
Yes	292	128	420 (66.4)
No	167	47	214 (34.6)
Observed flies in the house			
Yes	230	111	341 (53.8)
No	229	64	293 (46.2)
Room of cooks food			
Separate kitchen	136	61	197 (31.1)
Not separated kitchen	323	114	437 (68.9)
Hand wash after toilet			
Yes regularly /always	229	73	300 (47.6)
Yes, sometimes	196	78	274 (43.2)
Never	34	24	58 (9.1)
Contact community health services			
Yes	173	74	247 (39.0)
No	286	101	387 (61.0)
Atitude	301	91	392 (61.8)
Feverable	158	84	242 (38.2)
Unfeverable			

Table 3: *The housing and environmental related factors with respect to level of knowledge hygiene among mothers in Maksegnit District, Ethiopia, 2022.*

Knowledge about house and environmental hygiene

After adding the responses and computed mean, the level of knowledge about house and environmental hygiene among household mothers was 72.34% CI (68.9 - 75.7).

Factors associated with participant's level of knowledge

Socio-demographic variables included maternal age group, ethnicity, marital status, educational level of mothers, family size, residence, and access to media in a bivariable binary logistic regression analysis; environmental variables included housing end presence of latrines, type of water source, reliability of water in a year, waste disposal management practice, presence of livestock, fly presence in the house, place of cooking, and presence of animal faces near the house. From these variables, residence and access to media, fly presence in the house, and room of cooking were significantly associated with hygiene knowledge among household mothers.

In this study, urban dwellers were 1.61 times (AOR: 1.61; 95% CI [1.04, 2.49]) more likely than rural dwellers to have good knowledge about housing and environmental hygiene. Participants in the study who had access to the media were 1.82 (AOR: 1.82; 95% CI [1.17,

2.84]) times more likely to have good knowledge of housing and environmental hygiene than those who did not have access to housing and environmental hygiene information in the media. When compared to study participants whose houses had flies, those who had flies were 1.77 (AOR: 1.77; 95% CI [1.08, 2.91]) times more likely to have good knowledge about housing and environmental hygiene. As well, those study participants who make food in a separate room were 1.89 times more likely to have good knowledge toward housing and environment hygiene than those who make food inside the main living room (AOR: 1.89; 95% CI [1.13, 3.18]), and those study participants who make food in an open space outside the household were also 4.72 times more likely to have good knowledge toward housing and environment hygiene compared with those study participants who make food inside the main living room (AOR: 4.72; 95% CI [1.66, 13.56]). Finally, the probability of good knowledge was 2.94 times higher (AOR: 2.69; 95% CI: [1.33-2.82]) among participants who had a favorable level of attitude towards housing and environment hygiene (Table 4).

Variables	Knowledge level		COR (95% CI)	AOR (95% CI)
	Good	Poor		
Ethnicity				
Amhara	426	156	1.57 (0.87, 2.85)	-
Tigray	33	19	1	
Age groups				
18 - 26	69	18	1.62 (0.85, 3.08)	-
27 - 35	169	65	1.10 (0.68, 1.77)	-
36 - 44	131	54	1.03 (0.63,1.68)	-
45 - 70	90	38	1	
Maternal education				
Secondary and above	52	11	1.94 (0.99, 3.84)	-
Primary school	30	9	1.37 (0.64, 2.95)	-
No formal education	377	155	1	
Mothers' marital status				
Single	120	35	1.42 (0.93, 2.17)	-
Current married	339	140	1	
Family size in number				
≤ 4	249	80	1.41 (0.99, 1.20)	-
> 4	210	95	1	
Residence				
Urban	306	87	2.02 (1.42-2.88)	1.61 (1.04, 2.49) *
Rural	153	88	1	1
Access to media				
Yes	284	94	1.40 (0.98, 1.99)	1.82 (1.17, 2.84) *
No	175	81	1	1
Presence of latrine				
Yes	275	93	1.32 (0.93, 1.87)	-
No	184	82	1	
Water source				

Protected	429	155	1.85 (1.02-3.35)	-
Unprotected	30	20	1	
Waste disposal management				
Open field	221	99	1	
In the pit	161	52	1.39 (0.94, 2.06)	-
Burning near the yard	77	24	1.44 (0.86, 2.41)	-
Have live stock				
Yes	292	128	0.64 (0.06, 0.89)	-
No	167	47	1	
Animal faces near the HH				-
Yes	222	108	1	
No	70	20	1.70 (0.99, 2.94)	-
Observed flies in the house				
Yes	230	111	1	1
No	229	64	1.73 (1.21, 2.470)	1.77 (1.08, 2.91) *
Room of cooks food				
Inside the main living room	85	54	1	1
Separate room	323	114	1.80 (1.20,2.69)	1.89 (1.13, 3.18) *
Open space outside HH	51	7	4.63 (1.96, 10.98)	4.72 (1.66, 13.56) *
Attitude				
Favorable	301	91	1.76 (1.24-2.51)	2.94 (1.33-2.82) **
Unfavorable	158	84	1	1

Table 4*: Bivariate and multivariable analysis of factors associated with knowledge of housing and environment hygiene among mothers in Maksegnit district, Ethiopia, 2022.*

*Key: *= p-value < 0.05, ** p-value <0001, The Hosmer and Lemeshow Test P-Value was 0.422.*

Discussion

The aim of this study was to assess the level of knowledge and associated factors regarding house and environmental hygiene among mothers living in the Maksegnit District. As a result, the overall level of knowledge about house and environmental hygiene was 72.34% CI (68.9 - 75.7). This level of knowledge about house and environmental hygiene was in line with the percentages reported in literature, such as in urban areas in Northwest Ethiopia (75.7%) [29] and a study among mothers of under-five children in rural households, in Nepal (74.28%) [30]. Possible explanations for these similarities include the study participants' similar rural socio-demographic characteristics. However, the reported percentage of knowledge was higher than the previous studies in Northern Ethiopia 42.2% [22], Southern Ethiopia (62.1%) [28] and in Angolela, Ethiopia 52% [31]. These discrepancies might be due to differences in the study periods and participants. Study from in Angelia Ethiopia [31] the study participants were school-age children who are less knowledgeable about hygiene than adult study participants.

In this study, being urban, having access to media, having an absence of flies in the household, and cooking on an open space outside the main house were significantly associated with having good knowledge about hygiene among household mothers in Maksegnit District. Mothers who live in cities have a higher likelihood of having good hygiene knowledge than mothers who live in rural areas. This might be due to the fact that living in an urban area may create suitable conditions for ease of information sharing and communication due to improved access to mass media. This finding was supported by a study conducted in Tanzania [32] that discovered mothers who had access to mass media had a higher likelihood of having good hygiene knowledge than their counterparts. The possible explanation might be that media access inevitably increases their awareness of hygiene knowledge.

Similarly, those household mothers whose house was free from flies were associated with higher odds of good maternal knowledge about hygiene than mothers whose house was found to have flies. The possible reason might be that increased knowledge helps the mothers keep their home and its immediate environment clean and avoid breeding house flies. Moreover, those mothers who cooked in the open space outside the main living area had greater hygiene knowledge than those who cooked in the main house. This might be due to the fact that cooking in an open space other than the main living area might promote the hygiene and cleanliness of the living area, which are largely dependent on the presence of a separate kitchen for cooking. Finally, we also found a significant association of participants' attitudes and levels of knowledge. Another study supported this [28]. Persons with a positive attitude about house and environmental hygiene as a result of having a favorable attitude towards house and environment hygiene can often handle waste from home and the nearby.

Limitations of the Study

This study was limited by its cross-sectional design, which prevented causality determination. Another limitation was that we did not include qualitative data. Thus, there might be a bias toward social desirability. Also, the tool we used in this study was not a standard.

Conclusion and Recommendation

Overall, the level of knowledge was relatively low. Household mothers' good hygiene knowledge was significantly associated with urban living, access to media presence in the house, preparing food in the main living room, preparing food in open space outside the household and a favorable attitude. As a result, interventions that would address the above mentioned factors need to be implemented. The district health office should develop a health education program for both urban and rural mothers on the importance of latrines, hygiene facilities near latrines, a separate area for food preparation, access to water, and access to media on how to keep housing and the environment clean.

The low level of good knowledge can be improved by providing training for mothers, and women's health development armies' weekly discussion agendas should include the plan to raise issues related to hygienic housing and compounds to facilitate the sharing of information and increase the awareness of mothers. Therefore, health extension workers should design training programs on keeping houses and environments hygienic for strengthening participant's level of knowledge. Further research into the adequacy of sanitary services and hygiene information communication is advised.

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Availability of Data and Materials

The data sets used and/or analyzed during this study are available from the corresponding author on reasonable request.

Competing Interests

The authors have as declared that they have no competing interests in any aspect of the article.

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