

# Mothers Infant Sunlight Exposure Practice And Associated Factors At Dejen District, Amhara, Ethiopia 2021

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## Research Article

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# Abstract

**Introduction:** Currently, nutritional rickets has become a concern of many nutrition experts in many countries. Sunlight is the best and most reliable Source of vitamin D. since there is scarce information regarding infant sunlight exposure practice and the determinant factors. The study assessed mothers' infant sunlight exposure, practice level, and associated factors.

**Methods:** a community-based cross-sectional study was conducted on 884 mothers from March 20 to April 04/2017. Through the multi-stage simple random sampling method, the study areas had selected. The data were collected using a structured and pre-tested questionnaire and were entered into Epidata version 3.1 and exported to SPSS version 20 for analysis. The strength of association was measured using binary logistic regression at a 95% CI odds ratio. Finally, P-value < 0.05% was declared statistically significant.

**Results:** Out of the study participants, 866 (97.9%) were interviewed. Only 44% of mothers had good practice of infant sunlight exposure. In multivariate analyses; Knowledge status [AOR=1.4, 95% CI: (1.0-1.9)], Attitude status [AOR=1.4, 95% CI: (1.1-1.9)] , mothers age group [AOR= 8.6, 95% CI:(5.1-14.4)] ,mothers educational status [AOR= 5.2, 95% CI: (1.6-16.9), delivery at health facility [AOR= 1.5, 95% CI: (1.0-2.1)], and friend influence [AOR= 1.6, 95% CI: (1.2-2.1)] were significantly associated with the practice level of infant sunlight exposure.

**Conclusion:** This finding showed that the majority of the mothers did not expose their infants to sunlight appropriately. The mother's knowledge, attitude, educational status, institutional delivery, and friend influence were the significant factors and needs to work on these.

## Introduction

For centuries back to ancient Rome and Greece civilization, Sunlight exposure had used for therapeutic purposes (heliotherapy)[1, 2]. During the second half of the 19th Century, the sunlight had realized as a bactericidal and therapy purpose for rickets [1–4]. The level 25 (OH) D also determines the body's calcium homeostasis, bone health, cellular health, and immunity function. At least a level of 20ng/ml and 30ng/ml of 25(OH) D are required to maintain calcium homeostasis and maximal bone health and cellular health orderly [5–8]. It is crucial for the Immune system, maintaining cardiovascular function, healthy heart and circulation, respiratory system, healthy lungs and airways for Brain development, Muscle function, and anti-cancer effects[9].

Exposure of the body in a bathing suit to one minimal erythemal dose (MED) is equivalent to taking 10,000 to 25,000IU vitamin D orally. Therefore exposure of the body parts like arms, face, legs, and hands to sunlight for one MED two to three times a week is sufficient to get adequate body vitamin D requirement and even for the storage of vitamin D3 in the body fat[8].

Sunlight exposure is the cheapest source of vitamin D. When the skin expos to the sun, vitamin D will produce. Although sunscreen blocks ultraviolet light from damaging the skin, it does not blocks the production of vitamin D. Although most people believe using sunscreen lowers vitamin D production from our skin, no proven evidence supports their belief [10, 11].

Pieces of literature said that reduce exposure to the sun and choose sunglasses with medium to dark lenses for UV-A and UV-B protection during peak hours between 11 am and 4 pm when a person's shadow appears shorter

than they are [10, 12].

Vitamin D can be produced by our skin upon exposure to ultraviolet B (UVB) irradiation (280–320 nm) from sunlight [13]. More than 90% of the circulating vitamin D in the body originates from cutaneous production [13]. Sunlight converts 7-dehydrocholesterol in the skin to vitamin D<sub>3</sub>, which will be transported to the liver and hydroxylated to 25-hydroxyvitamin D (25(OH)D). It will then be conveyed to the kidney and hydroxylated to 1, 25-dihydroxyvitamin D (1, 25(OH)D) [13]. 1,25(OH)D is the metabolically active prohormone. The level has uses as a determinant factor of vitamin D status. Vitamin D deficiency will result in osteomalacia and rickets.

Recent studies have shown that vitamin D insufficiency is common in tropical countries even if there is sunshine throughout the year in this region due to malpractice and inadequate knowledge towards infant sunlight exposure [14].

Ethiopia adopts health education as a strategy to change maternal behavior on infants' sunlight exposure to prevent rickets in the country during the 1960s [15]. Implementation of this strategy remains low, inconsistent, and health messages had no focus that positively influences maternal practice, infants not to get adequate sunlight. Lack of sufficient information on the determinant of this risky behavior and the attitude of Ethiopian mothers were the pertinent reasons [15].

Vitamin D deficiency is prevalent among urban and rural Ethiopian school children for 61.8% and 21.2%, respectively [16]. The study had conducted on pregnant women and women of reproductive age showed that vitamin D deficiency is prevalent in Ethiopia [15–17]. Some initial and recent studies suggested that daily practice to sunshine remains the cheapest, safest, and most effective method of preventing rickets [15, 18].

There is no clear and adequate data regarding the mother's practice of infant sunlight exposure and its determinant factors. To fill this gap this study was conducted.

## **Material And Methods**

### **Study design, setting, and period**

A community-based cross-sectional study was done at Dejen woreda from March 20 to April 04/2017. The woreda had latitude and longitude of 10°10'N38°8'E and an elevation between 2421 and 2490 meters above sea level. It is one of the woredas in the Amhara Region of Ethiopia.

Based on the 2007 national census conducted by the Central Statistical Agency of Ethiopia (CSA), the woreda has twenty-three kebeles and 102,359 total population. Seven Kebeles had selected for the study.

### **Study Participants And Sampling Procedures**

All mothers who had an infant during the data collection period in the selected kebeles were the study populations. Whereas; every mother who fulfilled the inclusion criteria and had interviewed was the study unit. Through multi-stage sampling technique and simple random sampling method, a total of 884 infants had selected from seven kebeles as seen in figure (Fig. 1).

The sample size was determined through using both single and double population proportion Formula with the assumption of; population proportion 50%, Confidence level 95%, and margin of error 5%, none response rate 15%, and design effect 2

$$n = (z_{\alpha/2})^2 p (1-P)/d^2$$

Where n = sample size

P = proportion take as 50% (no previous study)

d = margin of error

$\alpha = 5\%$

$Z_{\alpha/2}$  with 95% confidence level = 1.96

And hence  $1.96^2 \cdot 0.5(1-0.5)/0.05^2$  Equal to 384 samples were required

And hence considering none response rate of 15%, and the sample size of this study was calculated as;  $384 \times 15\% = 58$  then  $58 + 384 = 442$  sample.

Multiplying 442 by the design effect 2 gives 884. For the associated factors, a double population proportion formula using EPI Info version 3.5.1 stat calc had used to calculate the sample size.

s.no	Variables	% prevalence	Confidence level	power	Prevalence of good practice	The ratio among exposed to unexposed	Odds ratio	Calculated sample size
1	Mother age group > 33years	16.6	95%	80%	40%	1:1	8.67	40
2	Diploma and above educational status of mothers	24.9	95%	80%	60%	1:1	3.24	136
3	Family size b/n 4-6	59.1	95%	80%	39.1	1:1	3.88	214

But the value was lower than the above sample size. Then the final sample size was 884 infants.

## Data Collection Methods And Instruments

The data had collected through five diplomas and one Bsc nurse supervisor. The Data were collected through the home-to-home visits using a structured interviewer-administered questionnaire. The questionnaires had five parts, socio-demographic characteristics, Knowledge, Attitude, Practice related, and associated factors of mothers towards their infant sunlight exposure. Before the data collection, the questions were translated into the local language (Amharic) from English.

## Variables Of The Study

The dependent variable was maternal practice level regarding infant sunlight exposure. Socio-demographic variables (Age of infant, Age of mothers, Mother Educational status, Husband educational status, Mothers Religion, Family size, Mothers Occupation, Father's occupation), social factor ( media influence, health professional influence, infant grandmother influence), and health-seeking behavior of mothers (ANC follow up, place of delivery), Knowledge status, and Attitude status were the independent variables.

## Operational Definition

Infant: a child whose age is less than twelve months old

Good practice: those mothers who responded to the practice-related questionnaires and scored above 8, the median value [19].

Poor practice: those mothers who failed to respond to the practice-related questionnaires scored 8, and less than 8, median values[19].

Good-knowledge: those mothers who responded to the knowledge-related questionnaires and scored above median value [20].

Poor knowledge: those mothers who responded to the knowledge-related questionnaires scored median and less than the median value [20].

Favorable attitude: - those mothers who responded to attitude-related questionnaires and scored above 40 median value [21–23].

Unfavorable attitude: - Those mothers who responded to attitude-related questionnaires scored 40 and below 40 median value. [21–23].

## Data Quality Control

Two days of training had given for both the data collectors and supervisors. The questionnaires were prepared initially in the English version and translated to the Amharic version and back to the English version before data collection for consistency. The pre-test had done on 5% of the sample in the other woreda. The supervisor and investigator were checked the data for completeness, missing, and unwanted filling daily. Finally, The data had entered into Epidata version 3.1.

# Data Processing And Analysis

During data collection, completeness, missing, and the unwanted filling had assessed daily. Then it was coded, categorized, and entered into EPI data version 3.1 and exported to IBM- SPSS version 20 for analysis. The association between each independent variable with the outcome variable had assessed using bivariate logistic regression. P-value < 0.2 in bivariate analysis covariate retained for multivariate analysis. Logistic regression analysis had performed to identify factors associated with the outcome variable. Finally, a p-value < 0.05 declare as statistical significance. The data had presented using tables, charts, and texts.

## Result

### Socio-demographic Characteristics

Of 884 sampled mothers 866, of them were interviewed in the study and make a response rate of 97.96%. Among 866 study participants, 534(61.7%) mothers had less than or equal six months of age infant. More than half, 460(53.1%) mothers had age less than or equal to 30years old (Fig. 1). The mean ( $\pm 6.371$  SD) age of mothers and infants was 31.1 ( $\pm 6.2$  SD) years and 5.7( $\pm 3.1$  SD) months subsequently. The majority of mothers 847, (97.8%), were orthodox by religion, 863 (99.7%) were Amhara by ethnicity. Almost 827(95.5%) were married (Table1).

Table 1  
Distribution of socio-demographic characteristics of study participants in Dejen woreda, East Gojam Zone, Amhara Region, Ethiopia, 2017 (n = 866).

Variables name		Frequency	(%)
Infant's age group	0–6 months	534	61.7%
	7–12 months	332	38.3
Mothers religion	Orthodox	847	97.8%
	Muslim	19	2.2
Mothers ethnicity	Amhara	863	99.7
	Oromo	3	0.3
Mothers Marital Status	Single	21	2.0
	Married	823	95
	Divorced	15	1.7
	Widowed	7	.8

More than half of mothers' family size was 4–6 family members (Fig. 2).and 769(88.8%) were farmers by occupation as shown in figure (Fig. 3).

# Knowledge Of Mothers Towards Infant Sunlight Exposure

The median value of knowledge of study participants was 7.5. Out of 866 study participants, 433 (50%) had poor-knowledge status regarding infant sunlight exposure. The majority of mothers (852, 98.4%), knows infant sunlight exposure were essential to the infant, and (373, 43.1%) had answered infant sunlight exposure are for the development, growth, and strength of bone, and 779(90%) of mothers know relatively the safest period of infant sunlight exposure. Regarding knowing the harmful effect of sunlight exposure (246, 28.4%), (38, 4.4%), (454, 52.4%), and (107, 12.4%) of mothers mentioned skin cancer, gigantism, dark skin pigmentation, and fever were respectively.

## **Attitude level of study mothers towards infant sunlight exposure.**

Almost 473(54.6%) of mothers had an unfavorable attitude. From these, 239(27.6%) and 211(24.4%) mothers strongly disagreed sunlight exposure did not have an evil eye effect.

# Practice Level Of Study Mothers On Infant Sunlight Exposure In April 2017

Five hundred six (56%) of mothers scored less than the mean value practice-related questionnaire. Even though 829(95.7%) of mothers intentionally expose their infants to sunlight. The majority of mothers 439,(50.7%), and 571 (65.9%), expose infants after applying butter on the infant's body and cover with a cloth (Table 2).

Table 2  
Practice level of study mothers regarding their infant sunlight exposure in April 2017

Practice related questions	Frequency	%
A mother intentionally expose their infant to sunlight	829	95.7
A mother who exposes 10-30minute daily to the sunlight.	732	84.5
Apply body lotion before exposing it to sunlight.	571	65.9
Apply butter to the infant's body before exposing to sunlight.	439	50.7
Covered all of the infant's body by cloth during exposure to sunlight.	459	53
Expose their infants to the sunlight at the mid-day	208	24
Outdoor	668	77.1
Longer than 1 hour in a day	252	29.1
After applying sunscreen lotion	429	49.5
Expose equally during summer and winter	496	57.3
Expose their infant to sunlight 10–30 minutes daily	761	87.9
Expose their infant to sunlight 40–60 minutes weekly	96	11.1
Expose their infant to sunlight for 1 hour at the weekend.	8	0.9
Expose their infant to sunlight for 2 hours and above at the weekend.	1	0.1
Did you start sunning your infant at the age of before 15 days?	214	24.7
Started sunning their infant at the age of 15–45 day	457	52.8
Started sunning their infant at the age of above 45 days	195	22.5

**Determinant factors of mothers' infant sunlight exposure practice.**

A significant association was observed between mothers' knowledge status; attitude status, age groups; educational level with the mother's practice level regarding infant sunlight, exposure. Mothers who had good knowledge regarding infant sunlight exposure were 1.4 times more likely to have a good practice of infant sunlight exposure than mothers who had poor knowledge status regarding sunlight exposure of their infant (Table 3).

Table 3  
Multivariate analysis of characteristics' associated with the practice status of study mothers regarding their infant sunlight exposure.

Variables		Practice status		COR(95%CI)	AOR(95%CI)	p-value
		Good	Poor			
Mother age group	15-20years	10(71.4%)	4(28.6%)	8.4(2.5–27.5)	4.9(1.1–21.6)	0.036
	21–26 years	151(70.6%)	63(29.4%)	8.0(5.4–11.9)	8.6(5.1–14.4)	0.000
	27–32 years	150(44.9%)	184(55.1%)	2.7(1.9–3.8)	2.8(1.9–4.3)	0.000
	≥ 33 years	70(23%)	234(77%)	1	1	0.004
Mothers educational status	URAW	42(27.1%)	113(72.9%)	1	1	
	1–8	115(45.6%)	137(54.4%)	2.3(1.5–3.5)	2.3(1.1–4.5)	0.020
	Certificate	47(78.3%)	13(21.7%)	9.7(4.8–19.8)	5.2(1.6–16.9)	0.007
Knowledge status	Good	216(49.9%)	217(50.1%)	1.6(1.2–2.1)	1.4(1.0-1.9)	0.000
	Poor	165(38.1%)	268(61.9%)	1	1	
Attitude status	favourable	199(50.6%)	194(49.4%)	1.6(1.3–2.2)	1.4(1.1–1.9)	0.000
	Unfavorable	182(38.5%)	291(61.5%)	1	1	
Delivered at the health facility	Yes	286(47.2%)	320(52.8%)	1.6(1.2–2.1)	1.5(1.0-2.1)	0.029
	No	95(36.5%)	165(63.5%)	1	1	
Friend influence	Yes	190(40.3%)	282(59.7%)	1.4(1.1–1.8)	1.6(1.2–2.1)	0.002
	No	191(48.5%)	203(51.5%)	1	1	
AOR; adjusted odds ratio, COR; crude odds ratio, URAW; unable to read and write						

## Discussion

More than 829(95.7%) of mothers intentionally expose their infants to sunlight. It is almost similar to the study done at Debre Markos, 96.6% [19]. But lower than at Jimma, which was 100%[17]. The reason behind this may be the educational level difference, and there may be a cultural difference. However, higher than the study at Townsville in Australia, that was 20%. The reason may be, Australia's cancer prevention society does not recommend infant sunlight exposure because of the high prevalence of skin cancer there and hence the fear of skin cancer. More than 77% of mothers expose their infants to sunlight outdoor. These were lower than Debre Markos and Sakarya. Which were 89.4% [13] and 87.5%[19] respectively. The reason behind this may be the

Lowlands. Ninety (90.5%) of mothers expose their infant in the relatively safest ( morning before 10 am and after 5 pm) period that was lower than Debre Markos [19]. The reason behind this may be mothers' educational differences. Half percent of the mothers expose their infant after applying butter to the infant's body. That is higher than the study done at Debre Markos, which is 43.7% [19]. The reason may be study participants did not educate the disadvantage of applying butter to the infant's body before exposing them to sunlight. That shows there was malpractice of infant sunlight exposure. In multivariate analysis, a mothers' knowledge status, Attitude status, mother's educational status, mother age group, delivery at a health facility, and mothers' friend influence had a significant association with the mothers' practice status.

## Conclusion

More than half of the mothers did not practice appropriate infant sunlight exposure. Mothers; educational statuses, knowledge status, attitude status, education status, age group, friend influence, and health facility delivery had significantly associated with the practice level of infant sunlight exposure.

## Declarations

### Ethics approval and consent to participate

The proposal was submitted and approved by the Debre Markos university ethical review committee as / / / / / / / / / /339/15/09 in 2017. A letter of permission had obtained from the Dejen woreda health office. A briefing had given for every study participant **before taking oral consent**. Confidentiality was maintained by excluding their name and personal identifiers.

### Consent for publication

Not applicable

### Availability of Data and Materials

The data sets used and analyzed in this study are available from the corresponding author. Data will not be shared to preserve the participant anonymity.

### Competing interests

The author reports no financial and non -financial competing interest in this work.

### Funding

This study had no fund.

### Author contribution

**AB.** Conceptualization **AB. AM.YH.BA.HT.** Formal analysis, **AB. AM.YH.BA.HT.** Development or design of methodology, **AB. AM.YH.BA.HT** Entering data into software, **AB. AM.YH.BA.HT.** Supervision, **AB.YH.BA.HT.** Writing original draft: **AB. AM.YH.BA.HT.** Writing review and editing, **AB ABYHBAHT** prepares all figures, **AB ABYH**

and BAHT prepare all tables, AB ABYH and BAHT wrote the main manuscript text, all authors read and approved the final manuscript.

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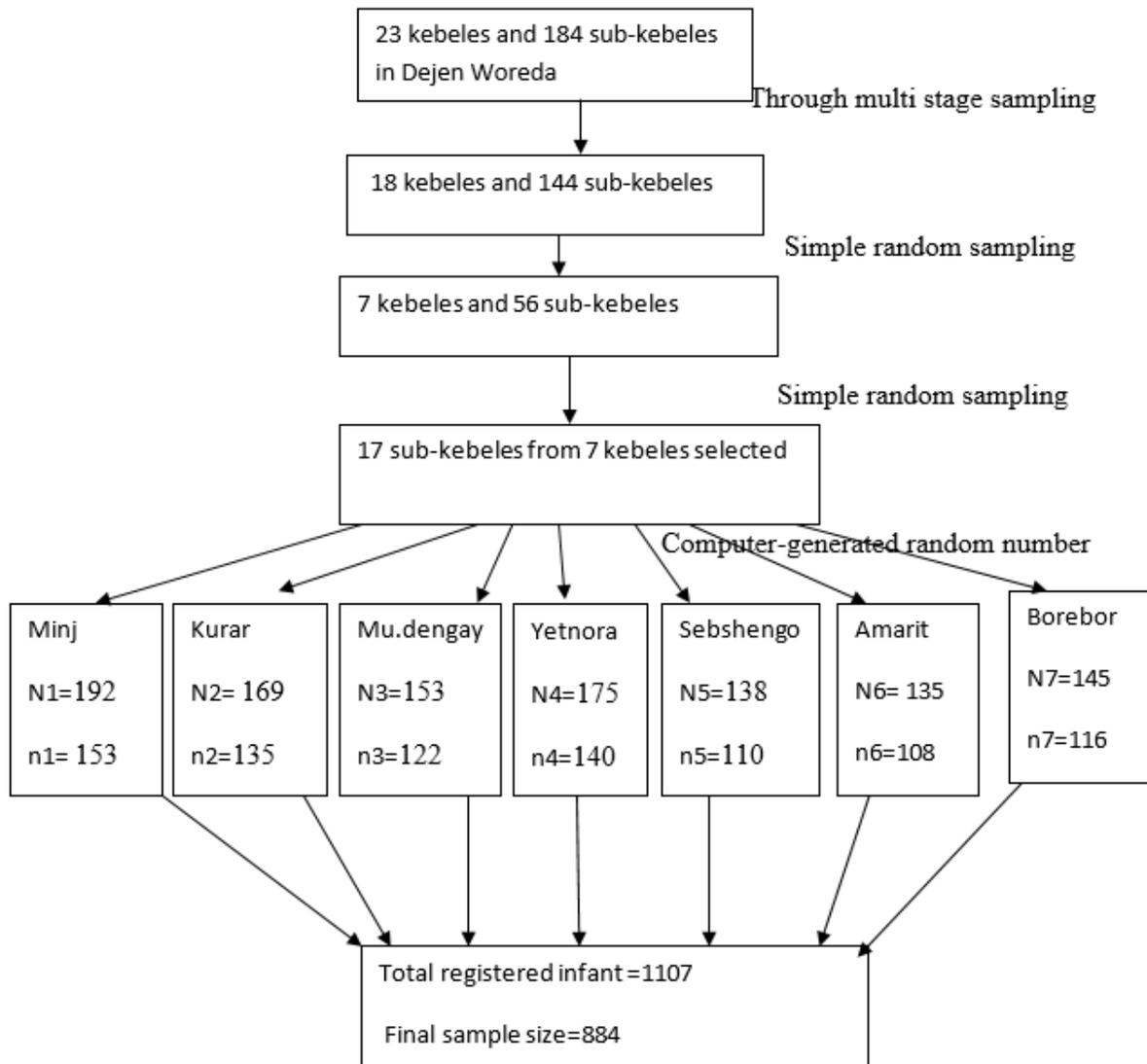
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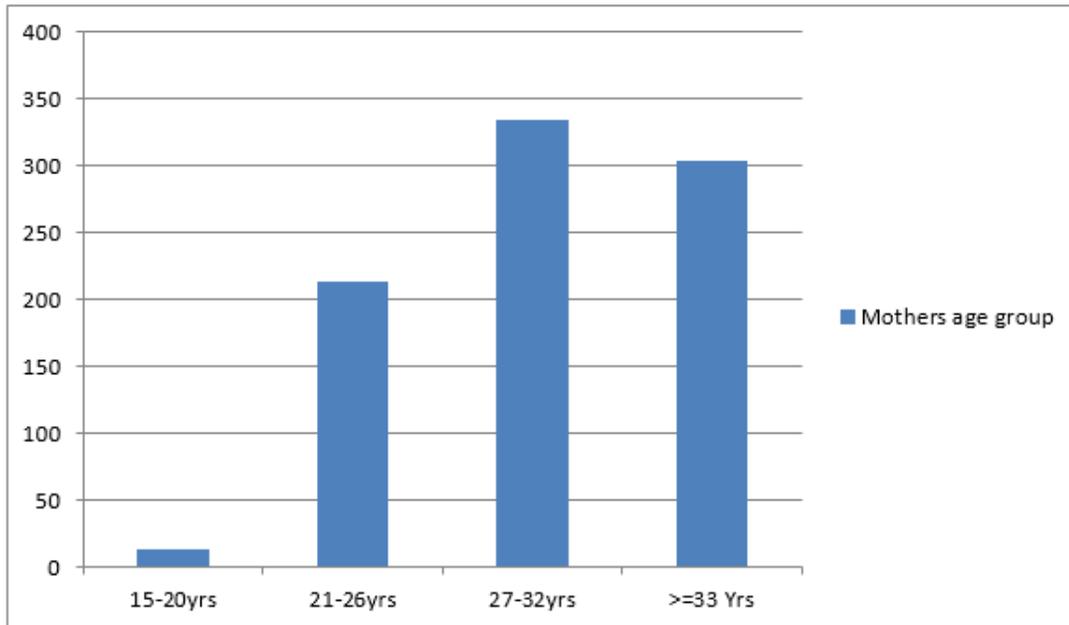
## Figures

## Sampling technique and procedure



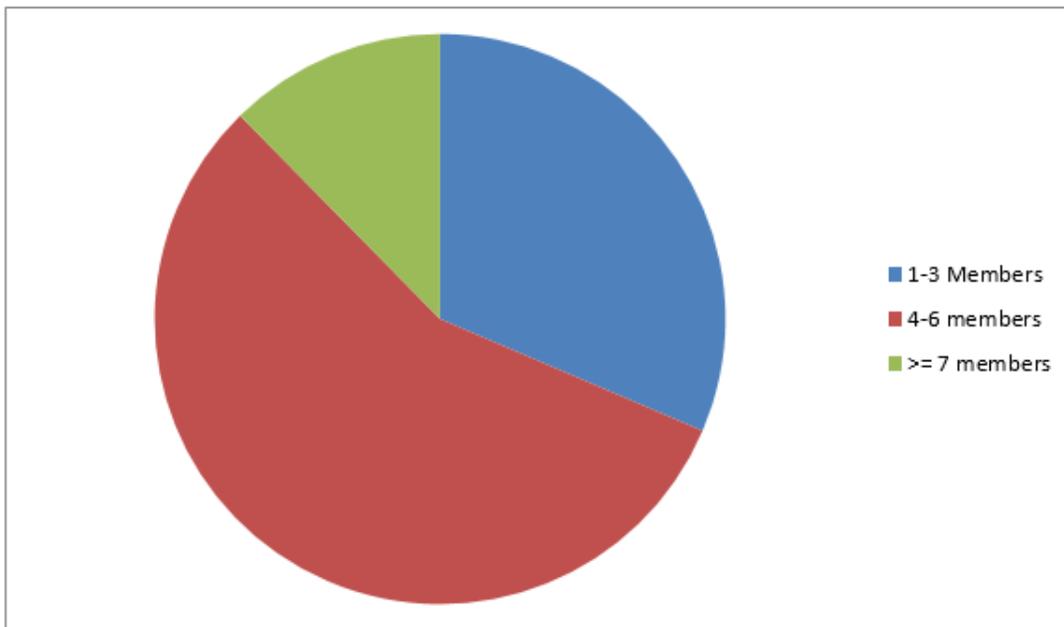
**Figure 1**

Schematic presentation of sampling procedure of knowledge, attitude, practice, and associated factors of mothers towards infant sunlight exposure in dejen 2017.



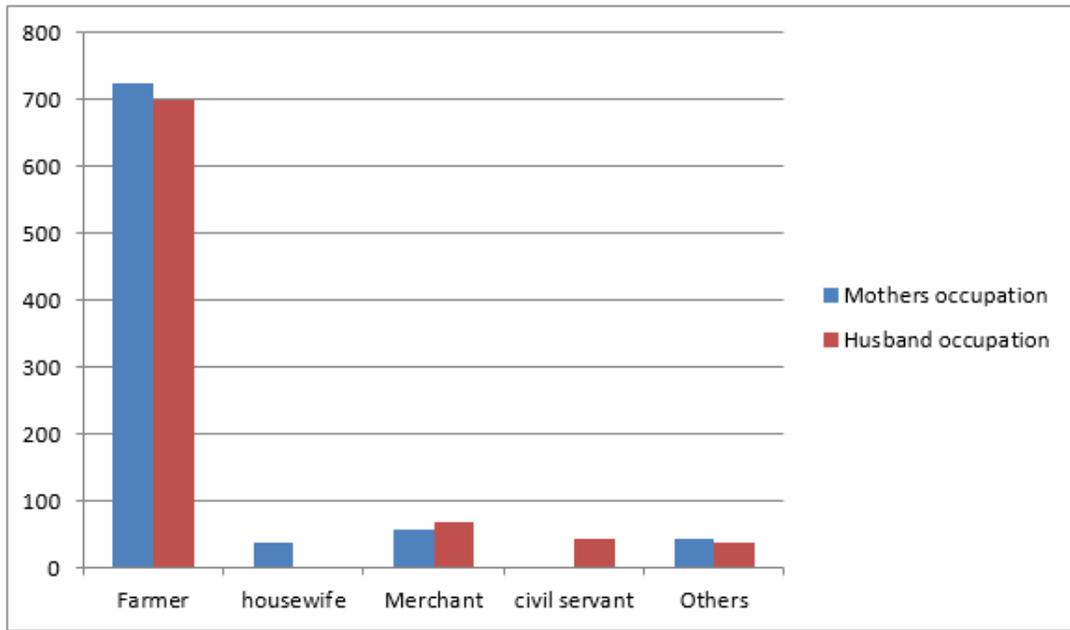
**Figure 2**

Mothers age group of the study participants in Dejen woreda, Ethiopia 2017 (n=866).



**Figure 3**

The family size of the study participants, Dejen woreda, Ethiopia 2017 (n=866).



**Figure 4**

Occupational status of the husband and mothers of the study participants Dejen woreda, Ethiopia 2017