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Research Article

Maternal Misconceptions Against Infant Sunlight Exposure Are Still Bottlenecks in Northwest Ethiopia, by 2022

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Background: Sunlight has been used for therapeutic purposes for neonatal jaundice. Exposure to sunlight is vital for the synthesis of vitamin D. Lack of exposure to sunlight is the single most important cause of rickets. Rickets is a major public health problem in many countries of the world, especially in Sub-Saharan Africa. Vitamin D deficiency due to low exposure to sunlight, suboptimal exclusive breastfeeding, and low vitamin D intake is one of the health problems in Ethiopia. The implementation of the strategy has remained inconsistent and lacked focus on factors that influence maternal practice, excluding infants from getting adequate sunlight.
Objective: To assess knowledge, practices, and factors affecting sunlight exposure of infants among women attending Debre Tabor Comprehensive Specialized Hospital, Ethiopia, 2022.
Methods: An institutional-based cross-sectional study was conducted through patient interviews at Debre Tabor Comprehensive Specialized Hospital from May 2022 to July 2022. Study participants were selected using a systematic random sampling method. A pretest was conducted on 5% (18) of participants before the actual data collection began. The data were collected by five BSc midwives. Data were entered into EpiData version 4.6.2 and exported to SPSS Software version 25 for further analysis. Bivariate and multivariate logistic regression analyses were carried out to test the association between each independent variable and the dependent variable. At 95% CI, variables with a p-value < 0.05 in the multivariate logistic regression model were considered as associated factors.
Results: About 67.5% and 62.1% of the mothers had good knowledge and good practice regarding adequate sunlight exposure, respectively. Mother's age, mother's educational status, marital status, and family size were the factors associated with sunlight exposure in multinomial logistic regression.
Conclusion and Recommendations: According to our study, participants did not have good knowledge and practice regarding sunlight exposure of infants. Therefore, health education focusing on the importance of sunlight exposure is important to improve the knowledge and practice of mothers towards sunlight exposure of their infants.

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Background

For years, sunlight has been used for therapeutic purposes, which dates back to ancient Rome and Greece [1]. In the second half of the 19th century, it was realized that sunshine could have a bactericidal effect as well as a therapeutic role in rickets [2][3][4][5]. In the 1950s, sunlight was first used for neonatal jaundice [2][3][4][5][6][7]. Placing a child in a room where sunlight enters through window panes (not in direct sunlight) for 10 minutes twice a day was often used to help treat mild neonatal jaundice [8]. Currently, exposure to sunlight has two interests: beneficial and adverse effects on human health.

In a study conducted at Aleta Wondo Health Center, SNNPR, Ethiopia, more than half, 196 (62.8%), of the study participants were knowledgeable about sunlight exposure [9].

Another study conducted in Debre Markos and Dejen District, Amhara Region, Northwest Ethiopia, found that 433 (50%) had poor knowledge status regarding infant sunlight exposure. The majority of mothers (852, 98.4%) knew that infant sunlight exposure was essential for the infant, and 373 (43.1%) had answered that infant sunlight exposure is for the development, growth, and strength of bones, and 779 (90%) of mothers knew relatively the safest period of infant sunlight exposure [10][11].

A study done in Farta District, South Gondar Zone, Northwest Ethiopia showed that nearly half (50.1%) of the respondents had knowledge of sunlight exposure for their infant. Of 183 respondents, 84 (46%) had knowledge of sunlight exposure every day, and 39 (11.4%) two times per week [12].

In a study done at St. Paul's Hospital, Ethiopia, about 40% of the mothers had poor practice regarding sunlight exposure. Out of 346 respondents, 318 (91.1%) of mothers exposed their babies to sunlight [13].

A study conducted in Debre Berhan Town, North Shewa Zone, Amhara Region, Ethiopia revealed that 65.7% of them had good practice in sunning their infants. Almost all (525; 99.1%) respondents intentionally exposed their infants to direct sunlight. Four hundred and fifty (85.7%) of the mothers started to expose their infants before they were 15 days old [14].

A study done in Debre Markos Town, Ethiopia, found that 60% of mothers had poor knowledge about sunlight exposure of infants [10].

A study in Ethiopia also found that a significant association was observed between maternal age and the knowledge of mothers; mothers in the age group of above 33 years were 8.67 times more likely to be knowledgeable than mothers in the age group of 15-20 years. The educational status of mothers was also associated with knowledge; mothers who have a diploma and above were 3.24 times more knowledgeable than mothers who were unable to read and write [11]. A family size of 4-6 was 3.88 times more knowledgeable than a family size of 1-3. Regarding sunlight exposure practice, there was a statistically significant association between maternal age and practice. A study conducted in Debre Berhan Town, North Shewa Zone, Amhara Region, Ethiopia, showed that maternal age, occupational status, perceived benefits to strengthen infant bones, perceived to result in a healthier infant, and source of information from health-care professionals were found to be significantly associated with maternal practice of infant sunlight exposure [12][13][14][15][16][17][18][19].

A study carried out in Debre Markos Town, Ethiopia, found that there was a significant association between maternal age, maternal education, family size, husband's educational status, and knowledge about sunlight exposure [10].

Methods and Materials

Study Area and Period

The study was conducted at Debre Tabor Comprehensive Specialized Hospital, Northwest Ethiopia. Debre Tabor is the capital city of the South Gondar zone, located about 666 kilometers from Addis Ababa (the capital city of Ethiopia) and 100 kilometers from Bahir Dar. This town has a latitude and longitude of 11°51′N 38°1′E with an elevation of 2,706 meters (8,878 ft) above sea level. The hospital was established by Italian missionaries in 1928. Currently, the hospital serves around 2.7 million people in the zone. Based on the facility-based report of the 2010 Ethiopian fiscal year, 1,268 children were delivered at Debre Tabor Comprehensive Specialized Hospital. The study was carried out from May 2022 to July 2022.

Study Design

A cross-sectional institutional-based study was conducted.

Source Population

The source populations were all mothers with infants attending PNC and immunization clinics at Debre Tabor Comprehensive Specialized Hospital.

Study Population

The study population were mothers with infants attending PNC and immunization clinics at Debre Tabor Comprehensive Specialized Hospital during the data collection period and who fulfilled the inclusion criteria.

Eligibility Criteria

Inclusion criteria

- Mothers of infants aged < 1 year attending PNC and immunization clinics at DTCSH during the study period.

Exclusion criteria

- Mothers with infants who were seriously ill, mentally incompetent, and unable to communicate.
- Those mothers with infants who were not willing to participate in the study.

Sample Size Determination

The sample size was calculated using the single population proportion formula by assuming p = prevalence of mothers' knowledge and practice on sunlight exposure in Debre Markos town = 44.6%(37), Z = 1.96, and D = precision (marginal error) = 5%. The sample size was calculated as follows:

$$n = \frac{(Z_{a/2})^2 P(1-P)}{d^2} = \frac{(1.96)^2(0.446)(0.554)}{(0.05)^2} = 379.679 \sim 380$$

n = 380

Where: - n = sample size

The total number of infants in Debre Tabor Town is 2,277. Since this figure is below 10,000, we use the following adjustment formula for the sample size: n = n / (1 + n/N)

Where,

- n = sample size for a population of size above 10,000
- N = number of infants in Debre Tabor Town Therefore,
- n = 380 / (1 + 380/2,277) n ≈ 341

Taking a 10% (34) non-response rate, the final sample size was **375**.

Sampling Procedure

Study subjects were selected using systematic random sampling. The sampling interval (K) was obtained by dividing the total number of mothers with their infants by the sample size at the vaccinated clinic in Debre Tabor Hospital, so that K = N/n = every 3rd study subject was interviewed until we reached 375 study subjects. The first study subject was selected by the lottery method from the sampling interval (K). Each study participant was selected using a systematic sampling technique in which every third client was interviewed in the Hospital.

Study Variables

Dependent variables

- Knowledge about sunlight exposure
- Practice of sunlight exposure

Independent Variables

Socio-demographic factors (age, religion, ethnicity, marital status, educational status, occupation)
Source of information (physician, nurse/midwife, TV/Radio, neighbours/elder people)
Other factors for sunlight exposure: Mothers' fear (Fear of Sickness, evil eye, Cold, Pneumonia)

Operational Definitions

Knowledge - The theoretical understanding of mothers about sunlight exposure of infants.

Good knowledge - Those mothers who responded to knowledge questions and scored above the median value of 4.

Poor knowledge - Those mothers who responded to knowledge questions and scored below the median value of 4.

Practice - Mothers' activity or behavioural experience in relation to sunlight exposure of infants.

Good practice - Mothers who responded to practice questions and scored above the median value of 6.

Poor practice - Mothers who responded to practice questions and scored 6 and below the median value.

Data Collection Tools and Procedure

A structured questionnaire was designed by reviewing different literature to include all the relevant variables to meet the objectives.

After informed consent was obtained, data were collected through face-to-face interviews using a prepared standard checklist and structured questionnaire. Three nurses and two midwives who were working at the immunization center were considered as data collectors.

Data Quality Assurance

The questionnaire was sent to two senior staff who are academicians and researchers for face validity; approval was obtained, and modifications were made. The questionnaire was prepared in the English version and translated into Amharic and back to English to check its consistency. A 5% pretest was done at Hidar 11 health center outside the study area. The collected data were checked for completeness, and the overall quality of data collection was monitored by the principal investigators.

Data Analysis Procedure

Data were entered into EpiData version 4.6.2 and exported to SPSS Software version 25 for further analysis. Mean, standard deviation, frequencies, percentages, and odds ratios were calculated. Binary and multiple logistic regression analyses were conducted to assess the association between independent and dependent variables. The strength of the statistical association was measured by odds ratios and 95% confidence intervals, and statistical significance was considered at P<0.05.

Results

Socio-Demographic Characteristics of Mothers

A total of 375 mothers, with a response rate of 100%, were involved. Of these, 176 (46.9%) were in the age range of 21-26 years, and 361 (96.3%) were married (**Table 1**).

Knowledge of Mothers About Sunlight Exposure of Their Infants

About 253 (67.5%) of the mothers had good knowledge about sunlight exposure. The overall knowledge of mothers about the effect of sunlight exposure was 77.8% (**Table 2**).

Practice of Mothers About Sunlight Exposure of Their Infants

Regarding the practice of mothers about the exposure of infants to sunlight, 233 (62.1%) of them exposed their babies to sunlight, and 36.9% of the mothers started exposing their infants at the age of 45 days and above (**Table 3**).

Factors Associated with Sunlight Exposure

Mother's age (21-26 (AOR=2.862 (1.862, 4.399)), 27-32 (AOR= 0.255 (0.154, 0.422)), and 33+ (AOR=1.909 (1.300, 2.803))), mother's educational status (grade 7-10 (COR= 0.486 (1.253-4.933)), grade 11-12 (AOR= 1.531 (1.531-3.214)), certificate and above (AOR=1.498 (1.909-2.471))), marital status (divorced (AOR=1.411 (0.144-0.177))), and family size (4—6 (AOR=3.28 (2.189-4.903))) were the factors associated with sunlight exposure in multinomial logistic regression (**Table 4**).

List of Tables

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Variables	Frequency	Percentage
Mother's age		
15-20	33	8.8
21-26	176	46.9
27-32	106	28.3
33+	60	16
Marital status		
Single	11	2.9
Married	361	96.3
Divorced	3	0.8
Mother's educational status		
Unable to read & write	37	9.9
Able to read & write	54	14.4
Grade1-6	111	29.6
Grade7-10	66	17.6
Grade11-12	15	4
Certificate and above	92	24.5
Husband's educational status		
Unable to read & write	19	5
Able to read & write	42	11.2
Grade1-6	11	2.9
Grade7-10	78	20.8
Grade11-12	64	17.1
Certificate and above	161	42.9
Mother's occupation		
Student	8	2.1
House wife	198	52.8
Government employee	98	26.1
Private employee	16	4.3
Daily laborer	19	5
Merchant	36	9.6
Family size		
1-3	236	62.9
4-6	127	33.9
>6	12	3.2

Table 1. Distribution of socio-demographic characteristics of mothers in Debre Tabor Comprehensive Specialized Hospital, 2022 (N=375).

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Variables	Frequency	Percentage
Had information about sunlight exposure (N=354)		
Yes	344	91.7
No	31	8.3
Source of information about sunlight exposure		
Health professionals	281	74.9
Television/radio	45	12
Neighbors/elder people	49	13.1
Sunlight exposure is beneficial (N=375)		
Yes	354	94.4
No	21	5.6
Sunlight exposure strengthens teeth (N=354)		
Yes	197	55.6
No	157	44.4
Sunlight exposure keeps child warm (N=354)		
Yes	98	27.7
No	256	72.3
Sunlight exposure stimulates vitamin D production (N=354)		
Yes	112	31.6
No	242	68.4
Sunlight exposure strengthens body (N=354)		
Yes	222	62.7
No	132	37.3
Sunlight exposure has harmful effect (N=375)		
Yes	54	14.4
No	321	85.6
Skin cancer is a harmful effect of sunlight exposure (N=54)		
Yes	42	77.8
No	12	22.2
Blindness is a harmful effect of sunlight exposure (N=54)		
Yes	40	74
No	14	26
Sterility is a harmful effect of sunlight exposure (N=54)		
Yes	2	3.7
No	52	96.3
Knowledge		
Good	253	67.5

Variables	Frequency	Percentage
Poor	122	32.5

Table 2. Knowledge of mothers about sunlight exposure of their infants in Debre Tabor Comprehensive Specialized Hospital, 2022 (N=375).

Variables	Frequency	Percentage
Expose your baby to sunlight (N=375)		
Yes	233	62.1
No	142	38.9
Age infant starts sunlight exposure (N=233)		
0-15 days	38	16.3
16-30 days	44	18.9
31-45 days	65	27.9
45 days and above	86	36.9
How frequently do you expose (N=233)		
Daily	170	73.4
Sometimes	62	26.6
Place to expose your baby to sunlight (N=233)		
Outdoor	207	88.8
Indoor	26	11.2
Time of the day you expose your baby outdoors (N=233)		
Morning 8-10 AM	214	91.8
Mid day 11AM-1 PM	13	5.6
Afternoon 2-4 PM	6	2.6
Condition of clothing during exposure (N=233)		
Unclothed	88	37.8
With diapers and eye protection only	28	12
Partly covered	77	33
Completely covered	40	17.2
Minutes you expose your baby to sunlight (N=233)		
< 15 minutes	83	35.6
15-20 minutes	57	24.5
20-1hr	88	37.8
Above 1hr	5	2.1
Apply lubricants on your baby's body during sunlight exposure (N=233)		
Yes	145	62.2
No	88	37.8

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Variables	Frequency	Percentage
Time to apply lubricants on your baby's body during sunlight (N=233)		
Before exposure	42	18
During exposure	158	67.8
After exposure	33	14.2
Things you apply (N=233)		
Baby vaseline	190	81.5
Baby lotion	18	7.7
Butter	25	10.7

Table 3. Practice of mothers regarding sunlight exposure of their infants in Debre Tabor Comprehensive Specialized Hospital, 2022 (N=375).

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Variables	OR at 95 % CI	
	COR(95% CI)	AOR(95% CI)
Mother's age		
15-20	1	1
21-26	0.432 (0.285, 0.654)**	2.862 (1.862, 4.399)**
27-32	0.255 (0.154, 0.422)**	4.338 (2.362, 7.964)**
33+	1.909 (1.300, 2.803**	1.432 (0.285, 0.654)**
Mother's educational status		
Unable to read & write	1	1
Able to read & write	0.321(0.171-1.600)	2.666 (0.282-1.282)
Grade1-6	0.316(0.181-2.554)	3.271 (0.790-5.978)
Grade7-10	0.486(1.253-4.933)*	2.122 (0.048-4.293)
Grade11-12	0.533(1.265- 2.069)**	1.531 (1.531-3.214)**
Certificate and above	0.583(0.364-0.934)**	1.498 (1.909-2.471)**
Marital status		
Single	1	1
Married	3.472(0.137-10.602)	1.010(0. 1.01-1.772)
Divorced	0.426 (0..108-1.673)**	1.411(0.144-0.177)**
Family size		
1-3	1	1
4-6	0.386(0.268-0.557)**	3.28(2.189-4.903)**
>6	0.459(0.310-0.679)*	2.051 (0.337-3.147)

Table 4. Associated factors with sunlight exposure among mothers in Debre Tabor Comprehensive Specialized Hospital, 2022 (N=375).

*NB: * = Association in binomial logistic regression, ** = Association in both binomial and multinomial logistic regression*

Discussion

This study revealed that about 67.5% of the mothers had good knowledge about sunlight exposure. The result of this study is higher when compared with the results of the studies conducted in Aleta Wondo Health Center, Dejen District, Farta District, and Debre Markos Town, where 62.8%, 50%, 50.1%, and 60% of the respondents had good knowledge of sunlight exposure for their infants, respectively [9][10][11][12]. Such discrepancies might have resulted either from cultural influences or poor awareness. However, this finding is lower when compared with the result found in a study conducted at St. Paul's Hospital, Ethiopia, which showed that 86.1% of the mothers had good knowledge towards sunlight exposure of their infants [20]. The possible reason may be differences in the study period, study area, and cultural differences. In addition to this possible justification for the variation, it might be due to differences in the awareness level of mothers concerning the importance of infants' sunlight exposure.

The current study found that the majority (91.7%) of the mothers had information about the need for sunlight exposure. This result is similar to the finding of the study done at Aleta Wondo Health Center, SNNPR,

Ethiopia, where 92.3% of the mothers had information about the need for sunlight exposure for their infants [9].

Regarding the practice of mothers, 62.1% of the mothers had good practice regarding adequate sunlight exposure. This finding is comparable with the results of studies conducted at Aleta Wondo Health Center (58%) and St. Paul's Hospital (60%) [11][12][13][14][15]. This finding is higher than the results obtained from the studies conducted in Dejen District, Amhara Region, and Farta District, South Gondar Zone, where 44% and 46% of the mothers had good practice towards sunlight exposure of infants, respectively [10][11][12]. The possible reason for this variation could be differences in the awareness level of mothers concerning the importance of infants' sunlight exposure.

Concerning the factors associated with sunlight exposure of mothers, mother's age, mother's educational status, marital status, and family size were the factors associated with sunlight exposure. Mother's age is significantly associated with sunlight exposure. Mothers in the age group above 33 years were 1.43 times more likely to be knowledgeable than mothers in the age group of 15-20 years. This finding is supported by the study conducted at St. Paul's Hospital, which showed that mothers in the age group above 33 years were 8.67 times more likely to be knowledgeable than mothers in the age group of 15-20 years [20]. This finding is also supported by the studies conducted in Debre Berhan Town and Debre Markos Town, which found that mother's age is significantly associated with sunlight exposure [10][14].

The educational status of mothers and family size are also associated with the knowledge of mothers towards sunlight exposure. This result is supported by the studies conducted at St. Paul's Hospital [20], Debre Berhan Town [14], Debre Markos Town [10], and Dejen District, Amhara Region [11].

Conclusion and Recommendation

According to our study, participants did not have good knowledge and practice regarding sunlight exposure of infants. Mother's age, mother's educational status, marital status, and family size were the factors associated with sunlight exposure.

Therefore, health education focusing on the importance of sunlight exposure is important to improve the knowledge and practice of mothers towards sunlight exposure of their infants.

Abbreviations and Acronyms

Abbreviation	Full Form
25 (OH) D	25-Hydroxy Vitamin D
CI	Confidence Interval
DCSH	Debre Tabor Comprehensive Specialized Hospital
HF	Health Facility
IU	International Unit
KM	Kilometre
OR	Odds Ratio
USA	United States of America
UV	Ultraviolet Radiation
VDD	Vitamin D Deficiency
WHO	World Health Organization

Statements and Declarations

Availability of Data and Materials

All data included in this manuscript can be accessed from the corresponding author upon reasonable request.

Competing Interests

The authors declare that they have no competing interests.

Funding

No funding.

Consent to Participate

Written informed consent from the respondents was obtained after thoroughly explaining the aim of the study to each respondent.

Consent for Publication

Not applicable.

Code Availability

All code for data cleaning and analysis associated with the current submission is available with the principal investigator and can be presented upon request.

Ethical Approval

Ethical clearance was obtained from the Institutional Review Board of Debre Tabor University, School of Midwifery, College of Medicine and Health Sciences (CMHS). A letter of permission was obtained from the clinical coordinator of each study hospital. A clear explanation about the purpose of the study was given along with the letter of support to all concerned bodies. Finally, written informed consent from the respondents was obtained after thoroughly explaining the aim of the study to each respondent. In addition, all methods were performed in accordance with the relevant guidelines and regulations.

Author's Contribution

BBE is the primary author, participated in the conceptualisation, design, analysis, and interpretation of the data, and drafted the manuscript.

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Declarations

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