Original article

Behavioral intention and factors influencing intention of Ethiopian mothers to expose infants to sunshine

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Abstract

Background: Nutritional rickets is common among Ethiopian children. It contributes to infant mortality and morbidity and carries long-term consequences. Factors influencing caretaker behavior of exposing infants to sunshine, a simple preventive strategy, are not fully understood.

Objectives: To measure the intention of Ethiopian mothers to expose their infants to sunshine and determine which of the Triandis variables (perceived consequences, affect, social factors) are associated with this behavioral intention of mothers.

Methods: The study was conducted in the Ethio-Swedish Children Hospital in Addis Ababa in April 1999. It involved 378 mothers of children who were selected by systematic random sampling. A pre-tested, structured and pre-coded questionnaire consisting 8-items for each subscale of variables in the Triandis Model (intention = value of perceived consequences of behavior + affect toward behavior + social factors) and selected socio-demographic variables was used to collect data.

Results: Perceived consequences, maternal marital status, and grand mothers role are independently and strongly associated ($p < 0.001$) with maternal intention. The final model explains 68%, a significant proportion ($p < 0.0001$), of the variability in intention. Maternal age, ethnicity, literacy level, employment status, and family size and income were not statistically significantly associated with this behavioral intention.

Conclusions: More comprehensive epidemiological studies on social, cultural, and psychological determinants of this risk behavior among Ethiopian mothers will be required. In the meantime, data from the present study can be used in developing health messages to mothers in Addis Ababa and other urban areas in the country. [*Ethiop. J. Health Dev.* 2002;16(1):31-40]

Introduction

In spite of adequate sunshine, vitamin D deficiency (nutritional) rickets has remained a common problem in the tropics and sub-tropics, including in some of the most populated countries such as China, India, Nigeria, Egypt, Iran and Turkey (1). In Ethiopia, its prevalence was in the order of 30% in the 1950s (2) and does not seem to have changed over the years (3-6).

Children between 3 months and 3 years of age are mainly affected (2-6). It often occurs in association with protein-energy malnutrition, diarrhoeal diseases, and pneumonia (5,6,8). Thus, apart from its long-term sequelae arising from bone deformities, vitamin D deficiency rickets contributes to childhood morbidity and mortality in the country.

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Decades have now elapsed since the pioneering studies on rickets in Ethiopia (2-5) showed that lack of exposure to sunshine was the single most important cause of rickets in Ethiopian children. Same pioneering studies as well as more recent work (6,7,9) suggested that daily exposure to sunshine remains the cheapest, safest and most effective method of preventing the disease. Indeed, health education to change maternal behavior to expose infants to sunshine was adopted as the main strategy to combat rickets in the country in the early 1960s (3). However, the implementation of the strategy has remained inconsistent and health messages lacked focus on factors that influence maternal behavior barring infants from getting adequate sunshine. This was largely because of lack of adequate information on the determinants of this particular risk behavior among Ethiopian mothers.

Aust-Kettis et al. in their descriptive study (3) found that the reasons, among mothers of 45 rachitic patients, were fear of exposing infants to the 'evil eye' or cold or pneumonia', baby's delicate skin not standing 'heat of the sun', and 'skin getting darker'. Woldemariam et al. (4) suggested that traditional beliefs were the underlying causes and Hojer et al. (5) indicated that fear of the 'evil eye' or a 'bad smell' was the reason for sunshine deprivation seen among Ethiopian infants. In subsequent studies (6-9), 'child neglect, 'cultural traditions, 'low maternal education, 'lack of medical care, 'insufficient basic resources and 'seasonal variation have variably been suggested as possible underlying causes.

Published reports from Ethiopia, thus, indicate that combinations of environmental, psycho-social and economic factors might variably and negatively influence maternal behavior of exposing infants to sunshine. Most of the studies (4-6,8,9) were, however, not primarily designed to investigate this risk behavior. Two of them (3,7) were surveys of knowledge, attitude and practice (KAP) of mothers but provided limited information. Moreover, these surveys were not designed to produce data that could fit into a testable theory of social behavior, which permits us to explain, predict and effectively change the risk behavior.

The present study was carried out to measure maternal intention to expose infants to sunshine and determine factors associated with intention by using the Triandis model (10). The model has been developed based on a comprehensive theory of social behavior, which applies to the study of health related behavior in different societies (11,12). It contains important KAP variables, defines the variables precisely and specifies how the variables are related to one another by using two equations (10,11). Equation 1: probability to act = (habit + intention)(motivation x facilitating conditions), and Equation 2: intention = value of perceived consequences of behavior + affect toward behavior + social factors. Given the reliabilities of the measures employed, Equation 2 of the Triandis model provides highly accurate predictions of behavioral intention (13,14), and is, thus, used as a framework for the present study.

Methods

The study was conducted at the Ethio-Swedish Children Hospital (ESCH), a tertiary training facility in Addis Ababa, which also serves as the major primary care centre for children residing in Addis and the surrounding districts. The hospital handles about 120 newly seen outpatients on each of the five working days. Nearly 90% of the patients are self-referred and about a third of them are infants.

The sampling frame for the present study constituted all mothers of children 0-12 months of age who were seen during the month of April 1999, and were consecutively registered in a separate logbook. Study mothers were selected by systematic random sampling. Mothers of infants who were brought for emergency situations or for serious illnesses requiring admission and those who

were brought by caretakers other than the mothers were excluded. All mothers who were eligible for the study were interviewed.

The hypothesis of the study was 'that among mothers of infants attending the ESCH, the explanatory variables in Triandis' Equations 2 (value of perceived consequences of behavior, affect toward behavior, and social factors) are independently associated with maternal intention to expose infants to sunshine. Based on Triandis' theory, intention was defined as maternal self-instruction to expose infants to sunshine. The value of perceived consequences constituted maternal evaluation of the con-sequences that she thought might have occurred as a result of the exposure. Affect included the direct emotional response of the mother to the thought of exposing infants to sunshine. Social factors constituted maternal self-instructions to do what was viewed as correct from the point of view of her moral code, and to do what was agreed to in previous interactions with others.

Maternal intention as well as each Triandis explanatory variable constituted a sub-scale in a pre-coded questionnaire, which included eight items for each sub-scale. Mother's response to each item was put on an ordinal, 5-point scale (assigned values 1-5). The sets of response options in each sub-scale were alternatively put from the least positive (least favorable) to the most positive (most favorable) response. Questions on demographic variables selected as secondary study factors were included at the end of the questionnaire. A consolidated summary of ethical issues was incorporated in the introduction to the questionnaire.

The questionnaire was translated into Amharic, back translated into English, and pre-tested in 30 mothers of children seen at the ESCH. The first 6 mothers of 0-12 months old children who were seen at ESCH on each of the five working days were used to pre-test the questionnaire. The content validity of the questionnaire was sought through open-ended interview of the mothers, which elicited a well-balanced sample of items mapping the content domain of each Triandis variable. Factor analysis (15,16) was applied to the questionnaire to select sub-scale items and obtain and test construct validity of the questionnaire. The internal-consistency coefficients for the selected final set of intention, perceived consequences, affect, and social factor items in the questionnaire were 96%, 84%, 92%, and 81%, respectively.

Maternal intention and the primary explanatory factors were all measured by the total and mean items scores for each sub-scale. In the calculations of the sample size, type I (α) error was set at 0.05 and the standard deviation of 7.0 (standard deviation of the mean score for affect obtained from the pilot study) was used. To estimate the total mean score to within 1 standard deviation, a sample size (adjusted to 80% response rate) of 378 mothers was required. For intention, perceived consequences and social factors smaller numbers of mothers were required.

The data were collected by a male pediatrician (principal investigator) using the face-to-face interview technique. The development of the questionnaire was supervised by a health social scientist (KD), who trained the principal investigator in the interview techniques. The Intercooled STATA, Version 5 statistical software for Windows (17) was used to analyze the data. The t-test (two-sided) was used to test for statistical significance of mean sample intention score. Multiple regression analysis was employed to assess for independent association between maternal intention and the explanatory variables.

Following the fit of a multiple regression model, a stepwise, backward elimination technique was employed to select the variables independently and significantly associated with maternal intention. Those explaining the smallest proportion of the variability in intention were dropped one at a time until a model with those variables explaining a significant portion of the variability in intention was identified. Possibilities for interaction among the essential variables were checked by comparing the adjusted coefficients of determination of models with and without interaction terms. Estimated coefficients and their standard errors were checked to assess for collinearity.

Results

The data were collected from 378 mothers during a one-month period, April 1 - 28, 1999. The demographic and socioeconomic characteristics of respondents are summarized in Table 1. Most (90%) of them were 20-39 years of age and their mean (SD) age was 28.2 (6.3) years. They were mostly (95.2%) from the four largest ethnic groups in the country.

Table 1: **Demographic socio-economic characteristics of the study mothers**

Characteristic		n	%
Age (years)	Under 20	19	5.0
	20-29	229	60.6
	30-39	111	29.4
	40-49	19	5.0
Ethnic group	Amahara	170	45.0
	Gurage	81	21.4
	Oromo	55	17.4
	Tigre	43	11.4
	Other ethnic groups	18	4.8
Educational status	Illiterate	28	7.4
	1-6 grade	56	14.8
	7-12 grade	243	64.3
	12+	51	13.6
Marital Status	Married	349	92.3
	Single		
	Never Married	14	3.7
	Divorced	6	1.6
	Widowed	6	1.6
	Separated	3	0.8
Employment status	Fulltime homemaker	253	66.9
	Employed		
	Government	58	15.3
	Private	52	13.8
	Unemployed		
	Daily laborer	7	1.9
	Retired	5	1.3
	Student	3	0.8
Family size	5 or less	286	70.9
	6-9	80	21.2
	10 or more	30	7.9
Number of children	1	148	39.2
	2-5	193	51.0
	6-10	37	9.8
Grand mother's role	Minimal or none	308	81.5
	Major	70	19.5

The mean (SD) duration of school attendance was 9.2 (4.3) years. Most (92.3%) of them were married and about two-thirds of them (66.9%) were full time house-makers. The median family size was 5 (range 2-15) and the median number of children was 2.0 (range 1-10). Family income, and history of rickets and other illnesses could not be measured reliably and hence dropped from analysis.

The mean (SD) item total scores for the primary independent variables, social factors, affect, and perceived consequences were 24.5 (7.9), 28.1 (7.3), and 25.7 (7.3), respectively Table 2). The mean (S.D) score for intention sub-scale was 24.9 (7.9) ($p = 0.328$). In a univariate analysis (Table 3), perceived consequences, affect, and social factors were all significantly associated ($p < 0.001$) with maternal intention to expose infants to sun-shine. The other factors that were positively and significantly associated with intention were unmarried maternal status ($p < 0.001$) and grand mothers' involvement in child rearing ($p = 0.001$). The other explanatory variables including maternal age, ethnic group, maternal education and employment status, number of children and family size were not statistically significantly associated with maternal intention.

In a multiple regression model that included all potential explanatory variables considered in the study (Table 4), there was no significant association between social factors and maternal intention to expose infants to sunshine. Having controlled for the effects of other potential confounding factors included in the model, affect and perceived consequences were significantly associated ($p<001$) with maternal intention. The other factors that were independently associated with intention were maternal education ($p = 0.029$), marital status ($p = 0.043$), employment status (0.044) and grandmother's involvement in childcare ($p = 0.001$).

Table 2: **Mean (SD) scores of maternal responses for items in social factor, affect and perceived consequences sub-scales**

Maternal Response	Item Mean Score	SD
Social factors sub-scale*		
Agreement to who wants or expects mother to expose her infant to sunshine		
Mother herself	3.9	1.2
Her spouse	3.7	1.2
Her mother	3.2	1.3
Other relatives	3.7	1.2
Mothers in my neighborhood	3.5	1.3
Traditional healers	2.6	0.9
The community	3.2	1.3
Health professionals	3.9	1.2
Mean (SD) item total = 24.5 (7.9)		
Affect sub-scale*		
Thinking of exposing my infant to sunshine makes me feel		
Happy	3.7	1.2
Excited	3.3	1.2
Satisfied	3.4	1.1
Indifferent	3.1	1.2
Angry	1.1	1.0
Bored	1.4	1.1
Worried	1.6	1.2
Guilty	1.3	1.0
Mean (SD) item total = 28.1 (7.3)		
Perceived consequences sub-scale**		
Exposing my infant to sunshine		
Makes my infant healthier	3.6	1.3
Makes my infants bones stronger	3.6	1.2
Helps my infant grow faster	2.6	1.2
Helps my infant sleep well	2.7	1.2
Exposes my infant to cold (pneumonia')	2.6	1.2
Causes squinting of the eyes	3.5	1.3
Exposes my infant to the evil eye	2.4	1.1
Interferes with my daily routines	2.4	1.1
Mean (SD) item total = 25.7 (5.7)		

* Rated on a scale of 5 (strongly disagree 1, disagree 2, can not decide 3, agree 4, strongly agree 5)
** Rated on a scale of 5 (very likely l, likely 2, can not decide 3, unlikely 4, very unlikely 5)

Explanatory variables that were associated with maternal intention after stepwise backward elimination of variables that failed to achieve statistically significant association with intention are presented in Table 5. Maternal employment and educational status failed to maintain significant association in this model fitting process. The final model includes perceived consequences, affect, maternal marital status, and grand mothers role. Each of these factors was independently and strongly associated ($p < 0.001$) with maternal intention. The final model explains 68% of the variability, a significant proportion [$F = 57.9$ ($p < 0.0001$)] of the variability in maternal intention to expose their infants to sunshine. There is no significant interaction between variables in the final model, and no large changes in partial regression coefficients or fluctuations in the standard errors are noted with model changes to suggest any collinearity.

Table 3: **Results of simple linear regression of maternal intention to expose infants to sunshine (total item score) on explanatory variables**

Variable	Parameter Estimate	t-value	P	R^2
Social factors (total item score)	0.49	4.20	<0.001	5.0
Affect (total item score)	0.91	7.27	<0.001	12.1
Perceived consequences (total item score)	0.98	11.53	<0.001	25.9
Maternal age (years)	0.32	0.47	0.641	0.1
Maternal education (years)	0.30	0.18	0.855	0.01
Mother unmarried	3.51	3.39	0.001	3.0
Mother employed	1.18	1.25	0.211	0.4
Maternal ethnic group*				
Oromo	0.81	0.70	0.482	0.1
Gurage	-1.96	-1.85	0.066	1.0
Tigre	-0.68	-0.49	0.622	0.6
Other ethnic groups	-0.37	-0.17	0.866	0.01
Family size	-0.25	-1.29	0.196	0.4
Number of children	-0.24	-0.98	-.328	0.1
Grand mother's role (Major)	4.38	3.96	0.001	4.0

* Amahara ethnic group taken as reference

Table 4: **Results of multiple regression of maternal intention to expose infants to sunshine (total item score) on explanatory variables**

Variable	Parameter Estimate	t-value	P
Social factors (total item score)	0.01	1.01	0.313
Affect (total item score)	0.60	5.20	<0.001
Perceived consequences (total item score)	0.95	11.33	<0.001
Maternal age (years)	0.49	0.81	0.421
Maternal education (years)	3.15	2.19	0.029
Mother unmarried	2.09	2.03	0.043
Mother employed	1.61	2.02	0.044
Maternal ethnic group*			
Oromo	1.13	1.13	0.259
Gurage	-1.65	-1.61	0.108
Tigre	1.31	1.12	0.264
Other ethnic groups	-2.23	-1.29	0.199
Family size	0.27	0.72	0.474
Number of children	-0.38	-0.75	0.454
Grand mother's role (Major)	3.02	3.25	0.001
	Y - intercept = - 38.73		
	Adjusted R^2 - 68.4%		
	F = 17.75 (P<0001)		

* Amahara ethnic group taken as reference

Table 5: **Results of stepwise multiple regression of maternal intention to expose infants to sunshine (total item score) on factors significantly associated explanatory variables**

Variable	Parameter Estimate	t-value	P	(95% CI)
Affect (total item score)	0.57	5.18	<0.001	0.35,0.78
Perceived consequences (total item score)	0.92	11.56	<0.001	0.77,1.08
Mother unmarried	3.18	3.74	<0.001	0.50,4.85
Grand mothers role (Major)	3.08	3.36	0.001	1.28,4,89
		Y - intercept = -31.76		
		R^2 = 67.9% (adj. R^2 = 67.0%)		
		F = 56.85 (P<0001)		

Discussion

The socio-demographic characteristics of mothers in the present study are similar to those of mothers of children constituting the general outpatient population of the hospital (ESCH Annual Report, 1999). The information on maternal intention and potential explanatory factors collected from this series of mothers was thought to reflect the feelings of the source population for the study. Nonetheless, this study was done among mothers of infants seen in a tertiary health facility. Although over three-quarters of the hospital patient population was comprised of non-referred cases, diagnostic filter bias is still a possibility. One thus needs to use caution against generalizing the results of this study in light of this limitation.

It has been believed by some that Ethiopian mothers do not expose their babies to sunlight for fear of consequences that babies catch cold or pneumonia' or are possessed by the 'evil eye' or that the babies' skin might be affected by the heat of the sun' (3-5). Aust-Kettis and co-workers (3) stressed that ignorance, but not poverty, is the underlying cause. Woldemariam et al (4) suggested that traditional beliefs compounded by socioeconomic and environmental factors influence maternal behavior of exposing infants to sunshine. More recent reports (6-9) indicate that various cultural, social, economic and environmental factors could underlie this risk behavior.

In the present study, non-married status (mother never married, widowed or divorced) was identified as a factor that significantly and negatively influenced maternal intention of exposing infants to sunshine. A recent study carried out in the same setting (9) has shown that this group of mothers are economically most disadvantaged and are largely unable to offer optimal care to their children, including optimal feeding and adequate exposure to sunshine. The study has also shown that children that are cared for by unmarried, divorced or widowed mothers are about 5 times as likely to develop nutritional rickets as those cared for by married mothers (9). There are also anecdotal evidences that this group of Ethiopian mothers often delegate the care of their babies to their relatives or other caretakers (6).

The single group of mothers in the present series is largely composed of young women. Women in the young age category constitute over one-fifth of the mother population in Ethiopia (18). In our setting where age at marriage in different social groups is commonly under 22 years (19) and social strife and family dislocation are rampant, young divorced or widowed mothers constitute a sizable proportion of the population. Indeed, it has been shown that infants born to single mothers are at a much higher risk of being premature babies (20) who are, because of their weight and prematurity, kept indoors for the first few months after birth. These factors could, at least, partially explain the strong negative association between maternal intention of exposing infants to sunshine and non-married marital status noted in the present study.

Social factors - individual and normative beliefs as well as individual self-concept - failed to attain significant independent association with maternal intention of exposing infants to sunshine. As measured by the different questions (items) in the social factors sub-scale, the spouse, neighbors, health workers, traditional healers, and the community at large had insignificant influence on mothers' performance of this particular behavioral intention. However, grandmother's direct role in the care of infants was significantly associated with maternal intention. In the present study, grandmothers appear to have a facilitating role for infants to get adequate exposure to sunshine. This is contrary to the belief, among health workers in particular, that grandmothers' involvement in child rearing predisposes infants to nutritional rickets (9).

The direct emotional feeling of mothers associated with the thought of exposing their infants to sunshine (affect towards the behavioral intention) is strongly and independently associated with their intention to expose their infants. The value of consequences of exposing infants to sunshine perceived by mothers has a similar association with intention. The final model with essential explanatory variables explains, though statistically significant, only 68% of the variability in maternal intention to expose infants to sunshine.

The present cross-sectional study collected data at one point in time and is, thus, open to bias among the study subjects trying to appear consistent in their responses. This could inflate the association between intention and the explanatory factors in the present study. The study was conducted in a hospital setting among mothers who brought their infants for care. There is, thus, a limitation to generalize the results of the study to wider population of mothers in the country.

The study did not attempt to predict maternal probability of exposing their infants to sun-shine. Such a prediction would require testing the association between the variables in Triandis Equation 1 [probability of act = (habit +

intention)(motivation + facilitating conditions)] (10,11). This was beyond the scope of the present study, which focused only on identifying explanatory variables in Triandis Equation 2 that are associated with maternal behavioral intention.

The relationship between intention and various determinants of intention as well as that between maternal intention to expose infants to sunshine and their actual behavior of exposing infants to sunshine needs to be assessed in population-based and longitudinal-type studies. Future work must examine more comprehensively the relationship between the components in the Triandis Model and maternal behavior as related to exposure of infants to sunshine. In the meantime, data generated by the present study can be used to develop health messages to mothers in Addis Ababa and other urban areas in Ethiopia.

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