

## Effect of social support networks on maternal knowledge of child health in rural Odisha, India

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### Abstract

**Introduction:** Mothers' knowledge of child health is associated with their children's well-being, and depends on their educational level and social support networks. In India, literature on social support networks as determinants of maternal knowledge of child health is scarce. This research was aimed to fill this gap, focusing on social determinants of maternal knowledge in rural Odisha, India.

**Methods:** A multistage cluster sampling design was adopted for the present study and 379 mothers (age:  $M = 28.79$ ,  $SD \pm 4.03$ ) were randomly selected by eight villages. A mixed-method research was used to integrate quantitative and qualitative data collection and analysis.

**Results:** Chi square test showed that a low level of maternal knowledge was statistically significant associated with the scheduled tribes/caste, a low level of education, the poorest wealth category, and with early marriage and young maternal age at first birth. The presence in own social support networks of high-educated ( $\beta = 0.06$ ,  $P < .001$ ), female ( $\beta = 0.04$ ,  $P < .01$ ) and old-age ( $\beta = 0.05$ ,  $P < .05$ ) people, and healthcare providers ( $\beta = 0.01$ ,  $P < .01$ ) as members was found to be positively related to a high level of maternal knowledge. Surprisingly, the presence of female ( $\beta = 2.68$ ,  $P < .05$ ) and high-educated people ( $\beta = 0.59$ ,  $P < .05$ ), and at least one healthcare provider ( $\beta = 0.33$ ,  $P < .05$ ) as social support networks members was statistically significant associated with a high level of maternal child-health knowledge also in low-educated mothers.

**Conclusions:** Maternal knowledge of child health does not depend only on the levels of mother's education, but also on the presence of an effective social support network that include female and high-educated people, and healthcare providers as members. Therefore, policymakers should promote social support networks in order to improve maternal knowledge of child health.

**KEY WORDS:** maternal knowledge; maternal education; child health; social support; social network; child nutrition.

## Riassunto

**Introduzione:** La conoscenza materna della salute dei bambini è associata al grado di benessere dei figli e dipende dal livello di istruzione materno e dai networks di supporto sociale. In India, la letteratura riguardante i networks di supporto sociale come determinanti di conoscenza materna della salute dei bambini è scarsa. Questa ricerca ha l'obiettivo di colmare questa mancanza, focalizzandosi sui determinanti sociali di conoscenza materna nella regione rurale di Odisha, in India.

**Metodi:** Per questo studio è stato adottato un campionamento a grappolo (cluster) multi-stadio e 379 madri (età media:  $28,79 \pm 4,03$ ) sono state selezionate in modo randomizzato. Un metodo di ricerca misto, quali-quantitativo, è stato utilizzato per integrare la raccolta e l'analisi dei dati.

**Risultati:** Il test del Chi quadrato ha mostrato che un basso livello di conoscenza materna di salute del bambino è associato in modo statisticamente significativo alle caste "Scheduled Tribes" e "Scheduled Caste", ad un basso livello di istruzione, ad una condizione familiare di povertà, alla giovane età di matrimonio e di nascita del primo figlio. La presenza nelle proprie reti di supporto sociale di membri con alti livelli di istruzione ( $\beta = 0.06$ ,  $P < .001$ ), di sesso femminile ( $\beta = 0.04$ ,  $P < .01$ ), di anziani ( $\beta = 0.05$ ,  $P < .05$ ) e di almeno un operatore sanitario ( $\beta = 0.01$ ,  $P < .01$ ) è stata associata positivamente ad un alto livello di conoscenza materna. Incredibilmente, la presenza di membri di sesso femminile ( $\beta = 2.68$ ,  $P < .05$ ) e con alto livello di istruzione ( $\beta = 0.59$ ,  $P < .05$ ) e di almeno 1 operatore sanitario ( $\beta = 0.33$ ,  $P < .05$ ) nelle proprie reti di supporto sociale è stata associata in modo statisticamente significativo ad un alto livello di conoscenza materna anche in donne con un basso livello di istruzione.

**Conclusioni:** La conoscenza materna della salute dei bambini non dipende solo dal livello di istruzione materna, ma anche dalla presenza di un efficace rete di supporto sociale che comprenda membri con un elevato grado di istruzione, di sesso femminile ed operatori sanitari. Pertanto, il nostro studio suggerisce che i responsabili politici dovrebbero incentivare le reti di supporto sociale per migliorare il grado di conoscenza materna della salute dei bambini.

### TAKE-HOME MESSAGE

*In India, maternal knowledge of child health can be improved by an effective social support network, which includes female and high-educated people, and healthcare providers. Therefore, policymakers should promote mothers' social support networks.*

**Competing interests** - none declared.

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## INTRODUCTION

It is well-known that there is a close relationship between mothers' knowledge of child-health and their children's well-being [1, 2]. According to a pioneering paper by Caldwell (1979), children of educated mothers experience lower mortality than do children of un-educated mothers [3]. Since then, several studies declared the existence of a linkage between mother's formal schooling and an increased level of child health and survival [3–10]. Particularly, a strong relationship between maternal education and their children's nutritional status was observed in several geographically distant settings, such as Brazil [6], India [11], Lesotho [12], and Bangladesh, this latter with regard to the correlation between high-levels of maternal education and low infant mortality rates [13]. According to Caldwell (1979), there are three main causal mechanisms, through which maternal education may affect child survival: 1) education improves health knowledge, which further promotes behavioral changes; 2) education endorses identification with modernity; and 3) education leads to empowerment of women within the household [3]. A subsequent review of the literature by Caldwell and Caldwell (1993) focused on two main mechanisms: 1) education improves child health by promoting the use of modern health services; and 2) education results in a wide range of behaviours that play a role in improving child health [14]. Probably, maternal education can improve child health and reduce infant mortality through various ways like women empowerment, enhanced use of modern healthcare services, small family size, better health knowledge, and increased family income [7, 14–16]. In Kenya, mothers' education persists as a strong predictor of child's nutritional status in urban slum settings, even after controlling for other factors [17]. Several studies showed that maternal knowledge of nutritional issues was related to children's nutritional status [18, 19], and other research showed a generally positive relationship between maternal education and child health outcomes such as childhood immunization

and infant morbidity [20, 21]. Oppong and Abu (1987) emphasized the positive effect of education on the mothers' health literacy rate, being increased both their access to information and their social and economic status [1]. However, an approach focusing only on the mothers' educational level can be limited, because education research in developing countries used only the literacy rate or years of schooling, and, for instance, in India years of schooling does not provide adequate measures of education [22]. Moreover, greater health knowledge is not necessarily a consequence of the curriculum covered in schools [23]. Indeed, the human capital (health knowledge) and cultural capital (communication skill) among mothers could be associated with a better medical care independently of levels of education [24]. In addition, the role of education should be re-evaluated because quality of health services is better in urban areas, while some empirical research showed that the effect of maternal education seems to be greater in rural areas than in urban areas [14, 16]. Furthermore, high-educated mothers come from high socioeconomic strata and more developed areas which have better healthcare systems and social-hygienic features of health. Indeed, Desai and Alva (1998) stated that the strong correlation between maternal education and child health does not necessarily indicate a causal relationship [25]. According to Rosenzweig and Schultz (1982), female schooling and health-care services only partially give to mothers useful knowledge concerning diseases, treatment of illness and child-care practices; in addition, it seems that the positive effect of formal education on child health is less significant when the public healthcare services are more accessible. Undeniably, women tend to use accessible health services regardless of their educational level [26]. Probably for this reason, the relationship between maternal education and child survival is weaker in sub-Saharan Africa than in other developing countries [27]. In this way, other studies found that knowledge of health practices and contraception is not usually corresponding to school curricula [15], while

social networks and media would have a huge role in health knowledge diffusion [28]. Other studies showed that social cohesion within own community can promote social processes in the family environment, which contribute to the improving of the health of the children and adolescents [29]. Social-networks can offer several types of support - financial, material, of social company, cognitive guidance, and advice, and legal, and others [30]. The social network can be considered as the sum of all the relationships which the individual perceives as significant or differentiated from the anonymous mass of society. Therefore, family and community's social support networks can increase level of health and reduce infant mortality rate [31]. Social networks were also described as the web of social relationships surrounding an individual, in particular, structural features, such as the type and strength of each social relationship [32]. A study showed the positive influence of the social support network on the emotional sphere of parents with children affected by chronic diseases [33]. Another study from Guatemala (2001) found that interpersonal social contacts predominantly influence cultural beliefs regarding disease causation, as well as educational level and socio-economic status of those people [34]. According to a recent review, grandmothers have extensive knowledge and experience concerning most important aspects of maternal and children health across many communities and cultures of non-western societies; for this reason, they could play an important role in promoting well-being of children, mothers, and family [35]. Moreover, Montgomery (1998; 2000) suggested that mortality rate of people with a low socio-economic status could be reduced by improving the education level of members who are a part of their social networks [36, 37]. Another recent study focusing on traditional and modern childcare practices, found that mothers-in-law can have an influence on traditional or herbal medicine care [38]. However, to our knowledge, no study in India was mainly aimed to examine social support networks as determinants of maternal knowledge of child

health. Moreover, the role of family members and social networks in improving the health literacy of mothers has not yet been sufficiently explored. In a preliminary study presented at a conference, we explored the role of social networks concerning the mothers' knowledge of child care practices in Rural Odisha, India [39]. This research corroborates and extends the preliminary findings of that former study, focusing on maternal knowledge of child health in rural areas of India, its determinants and the role played by relatives and social networks. Specifically, the present study addressed the following research questions:

- 1) What is the level and potential sources of maternal knowledge of child health?
- 2) What is the role of education, socio-economic factors, social support networks, and community-based characteristics in predicting maternal knowledge of child health?

## METHODS

### *Design of study*

We used a mixed method research, integrating quantitative and qualitative data collection and analysis. Indeed, such an integration permits a more complete and synergistic utilization of data than separating quantitative and qualitative data collection and analysis.

### *Study Area*

The present study was carried out in Odisha State, India. It was based on primary data (both qualitative and quantitative) collected from a rural area named 'Dharmasala', which is a sub-district of Jajpur district with low levels of socio-economic development, during January-July 2012. In India, Odisha State ranks second in infant mortality rate (IMR) with 49 infant deaths per 1,000 live births [40]; moreover, more than one-third of children are underweight [41]. In Odisha, only half of all mothers exclusively breastfeed their children for the first six months [42]. Jajpur district, because of its high IMR (it ranks 159 out of 593 districts in India), was selected for the present study [43].

### Sample Design

A multistage cluster sampling design was adopted for the present study. The sub-districts, villages, households, and individual women were the units of the multistage sampling, which were drawn by the Census Population for Jajpur district. Dharmasala was selected because it is a sub-district well-representative of Jajpur, due to a totally rural population, and socio-economic conformity to Jajpur district. The last Census determined the resident population of this sub-district over the 3,160,544 persons of which a 19% belonging to Scheduled Castes (SC) and 6% to Scheduled Tribes (ST). Seventy-two percentage of Dharmasala's population was literate [44]. All Dharmasala's village were randomly selected, and a stratified sampling was used to divide the entire population into different subgroups based on different level of literacy and different access to the public healthcare facilities. Four villages each were randomly selected from the categories with high and low levels of literacy. This classification was based on the average literacy rate in Dharmasala's sub-districts; therefore, villages with a literacy rate below the average literacy rate

of Dharmasala were considered as low-literate villages and vice-versa. The eight villages were further divided into two types of village: a) villages with healthcare facilities, and b) villages without any healthcare facilities. Finally, four villages including healthcare facilities were chosen, two from each literacy category, in order to study the effect of healthcare facilities on mothers' child health knowledge and care practices, based on their educational levels (Fig. 1). Secondly, we calculated from the selected villages (Primary Sampling Units) the required sample of households. Between January and February 2012, we carried out a household listing operation from selected villages, in order to identify the eligible respondents from households, which were mothers with at least one child under five. Therefore, fifty households were selected from each village by using a simple random sampling. In case of more eligible women in the same household, we used the Kish selection method, which is a tool for selecting members within a household, to be interviewed when there are most respondents in one category [45]. The main survey was conducted during April-July 2012.

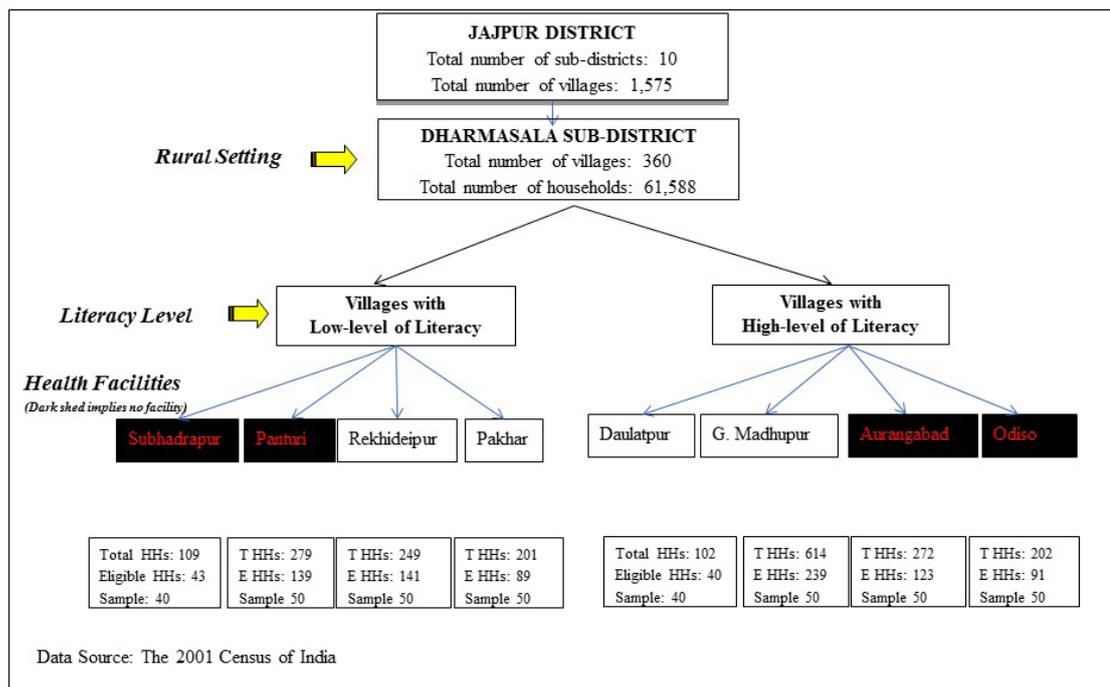


Figure 1. Sample design of the study.

### *Sample Size Determination*

The primary survey was limited to households including mothers aged 15–44, and with at least one child under five. To determine the number of required households for our study, we used the following formula:

$$n = \frac{1.96^2 * p * m * d}{me^2}$$

Where  $p$  = diarrhoea prevalence among children in rural Odisha, i.e. 13.5% based on District Level Household and Facility Survey (DLHS-3, 2007-08) [42];  $q = 1-p = 86.5\%$ ; Non-response ( $m$ ) = 5%; Design effect ( $d$ ) = 2; Margin of error = 5% of the  $p$ . We calculated a sample size of 377, which was rounded up to 380. However, our analysis was carried out on 379 cases due to an incomplete information from one respondent.

### *The Instruments of the survey*

#### *Quantitative data*

Data for the present study were collected by using structured interview schedules. There were two types of schedules: the 'household' schedule and the 'individual' schedule. The first one was developed to collect information regarding mother's family members and her socio-economic status. The second one was divided into 4 sections: a) socio-demographic section, which focused on individual characteristics such as age, educational status, access to transportation (mobility), mass media exposure, and degree of decision-making power; b) health-knowledge section, which focused on cognitive ability to understand health information concerning preventive and curative care (both modern and traditional medicine); c) social support network section, which was composed of questions about mother's social networks (e.g., the likelihood to seek advice from somebody –within or not the household– about several child care issues); and d) child-care section about practices regarding child-care health and nutrition. Items were based on literature reviews, availability of survey questionnaires by literature about

mother's knowledge of child health and other social issues, and opinions or suggestions provided by an expert panel composed by professors of the International Institute of Population Sciences (IIPS) in Mumbai, India. The content validity of the questionnaire was established through existing questionnaires and a literature review was carried out by authors, while the face validity was tested by the experts in the field employed in our University. The questionnaire was pretested before the main survey was conducted. The responses in the first administration were used in assessing construct validity and internal consistency reliability. In our study, overall internal reliability (Cronbach's alpha = 0.92) and test-retest reliability (0.88) were high.

#### *Qualitative Data*

Several face-to-face interviews ( $n = 16$ ) with key informants were conducted to collect information from a wide range of people, including community leaders, professionals, or residents who had first-hand knowledge about the community (e.g., resources, structures, schools, healthcare facilities, cultural and hygienic behaviours etc.). Moreover, semi-structured interviews ( $n = 24$ ) were undertaken with some experienced people. Interviews were transcribed 'verbatim' by the researcher. Topic guide was developed based on literature review to facilitate standardized/consistent interview structure. Face-to-face and semi-structured interviews were used to set up the questionnaire and to get confirmation of results.

#### *Ethical consideration*

The Research Evaluation Committee of the International Institute of Population Sciences in Mumbai, approved our study in compliance with the Helsinki declaration. In our study, confidentiality was addressed during research planning by an approval from ethics review boards, and at three points during the research process: data collection, data cleaning, and dissemination of research results. Each questionnaire had attached an informative letter on the first page, which explained the

free participation, anonymity, and confidentiality of our study. All respondents provided written informed consent before their participation.

### *Variables in the study*

The outcome variable was the maternal knowledge of child health and nutrition. Therefore, an overall index to assess the level of maternal knowledge of children's healthcare issues was specifically created for the purpose of this study. The 'Index of Maternal Knowledge (IMK) included questions on breastfeeding, immunization, children's diseases such as diarrhea, respiratory problems (ARI) and febrile illness. Moreover, it included some aspects of maternal childcare nutritional knowledge such as the following: 1) age for introducing semi-solid foods into a child's diet; 2) mother's knowledge of importance of feeding colostrum to the child; 3) giving fluids during diarrhoea; 4) giving semi-solid foods during diarrhoea; and 5) correct preparation of oral rehydration solution (ORS). Our index was partially drawn by the childcare nutritional knowledge questionnaire (CNKQ) elaborated by Saaka [46], and was based on the Andrzejewski's model that was developed for the Ghana [47], even though it was adapted to Indian context. The total score of the IMK was 30. Its overall internal reliability was high (Cronbach's alpha = 0.82). Scoring was recoded into three groups: low (0-10), medium (11-20), and high (21-30). The predictor variables were the following: a) individual characteristics (age, educational level, type of caste); b) household-based factors (household wealth and women's exposure to media); c) social network-based factors (age, gender, and educational level of members of social-networks), and d) community-based factors (literacy rate, availability of electricity and health facilities, proportion of SC/ST population). Wealth is a household characteristics that often has a large effect on health. For this reason, we developed an index named 'Wealth Index', which was based, as suggested by literature, on data concerning the household's ownership of a number of consumer

items such as a television and car, dwelling characteristics such as flooring material, type of drinking water source, toilet facilities; and other characteristics that are related to wealth status. The 'Wealth Index' allows for the identification of problems particular to the poor. The Principal Component Analysis (PCA) is used as a method for determining weights for components of the wealth index. Guidelines for using PCA for wealth indices were published at Demographic Health Survey (DHS) programme website [48]. We weighted responses at the individual level by using PCA and based on selected economic proxies of households. The 'Wealth Index' scores were subsequently divided into five 'wealth quintiles' as follows: the poorest 20% into quintile one, the second poorest 20% into quintile two, the middle 20% into quintile three, the second wealthiest 20% into quintile four, and the wealthiest 20% into quintile five. This procedure was already used in past demographic and health surveys [48]. Therefore, in this analysis, we considered the 'poorest' and 'poor' categories as 'Poor', the middle quintile as 'Middle', and the two wealthiest categories ('rich' and 'richest') as 'Rich'.

### *Statistical methods*

Frequency, percentage, t-test, chi-square with p-value were used for description of the study population in relation to relevant variables. In addition to descriptive statistics, multivariate linear regression models were used to examine the association between individual, household and social (social support network and community) determinants (independent variables) and child health-related maternal knowledge scores (dependent variable). A three-model simple linear regression was used. In the first model, we considered only social-network characteristics, while in the other two models we included all other predictor variables. Statistical significance was considered at a p-value < 0.05. Strength of association was also assessed using beta coefficient with a 95% confidence intervals. Quantitative data analysis was performed using the IBM SPSS 20 Package and Stata

10.0 software whereas the qualitative data was analyzed through Atlas.ti software Package.

## RESULTS

As showed in Table 1, the mean age of the study respondents was 29 years ( $DS \pm 4.03$ ). Almost half of the respondents (45%) were in the 25–29 year group, and only 11% of them

aged 35 and over. The mean age at marriage for respondents was 22 years, and more than 11% were married before 18. The mean age at birth of first child was 23 years, but one-in-five women aged less than 20. Three-quarters of them (77%) were formal educated. Almost half of them (42%) had received a secondary education.

**Table 1.** Socio-demographic characteristics of the sample ( $n = 379$ ).

Characteristics	%	N
<i>Age group (M = 28.79; DS ± 4.03)</i>		
20-24	12.1	46
25-29	44.9	170
30-34	31.7	120
≥ 35	31.7	43
<i>Women's age at marriage (M = 21.81; DS ± 2.87)</i>		
15-18	11.1	42
19-21	37.7	143
22-24	32.7	124
≥ 25	18.5	70
<i>Women's level of education</i>		
Uneducated/Illiterate	22.7	86
Primary	17.7	67
Secondary	42.0	158
Higher	17.7	67
<i>Mother's age at birth of first child (M = 23.15; DS ± 2.96)</i>		
< 21	19.0	72
21-24	47.9	181
≥ 25	33.1	125

Table 2. Level of maternal child-health knowledge and characteristics of the sample ( $n = 379$ ).

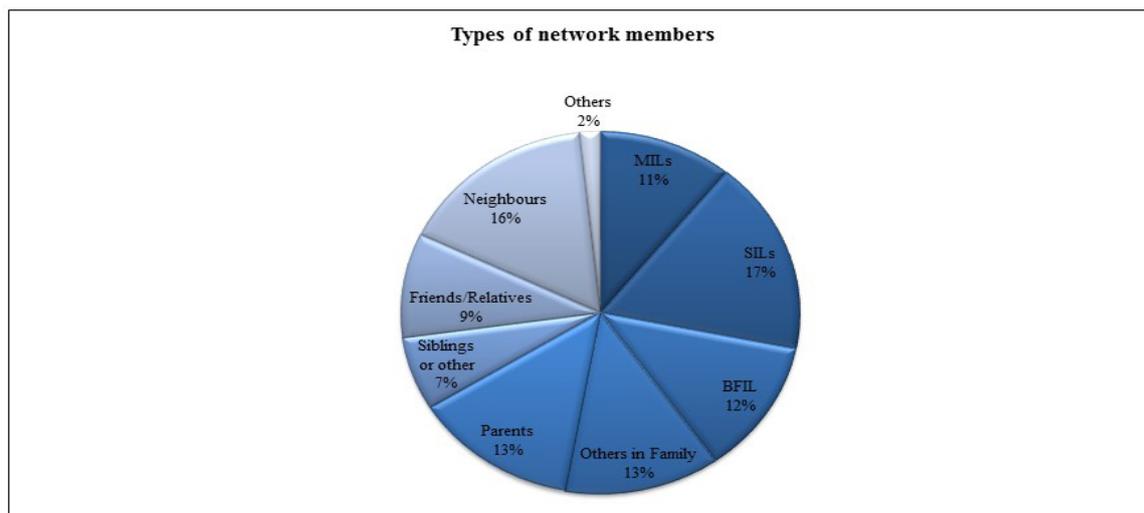
Characteristics	Level of maternal child-health knowledge				$\chi^2$	P-value (df)
	Low IMK (%)	Medium IMK (%)	High IMK (%)			
<b>Age groups</b>						
20-24	10.9	50.0	39.1	11.95	0.06 (6)	
25-29	7.1	55.3	37.6			
30-34	8.3	40.0	51.7			
$\geq 35$	16.3	53.5	30.2			
<b>Education</b>						
Illiterate	26.7	68.6	4.7	153.71	0.00* (6)	
Primary	13.4	62.7	23.9			
Secondary	1.3	50.9	47.8			
Others	0.0	9.0	91.0			
<b>Type of caste</b>						
Scheduled Castes/Tribes	22.9	61.0	16.1	72.39	0.00* (4)	
Other Backward Class	3.3	48.1	48.6			
Others	1.2	36.2	62.5			
<b>Women's age at marriage</b>						
15-18	19.0	54.8	26.2	13.00	0.00* (6)	
19-21	7.7	54.5	37.8			
22-24	8.1	47.6	44.4			
$\geq 25$	7.1	40.0	52.9			
<b>Mother's age at birth of first child</b>						
< 21	19.4	48.6	31.9	18.46	0.00* (4)	
21-24	6.1	55.2	38.7			
$\geq 25$	7.2	41.6	51.2			
<b>Women's exposure to media</b>						
Low ( $\leq 2$ h/die)	11.0	54.7	34.3	36.91	0.00* (2)	
High ( $\geq 2$ h/die)	0.0	27.1	72.9			
<b>Household's Wealth Index</b>						
Poorest	34.7	60.0	5.3	177.45	0.00* (8)	
Poor	5.2	80.5	14.3			
Middle	1.3	53.3	45.3			
Rich	1.3	36.4	62.3			
Richest	2.7	17.3	80.0			

<b>Level of network members' education</b>					
No higher educated (>10 years of education)	12.8	54.7	32.4	14.16	0.00* (2)
At least one higher educated (>10 years of education)	5.5	45.0	49.5		
<b>Presence of healthcare providers in mother's network</b>					
None	7.9	43.9	48.2	3.13	0.00* (4)
At least one	5.4	46.1	48.5		
<b>Female literacy rate in mother's community</b>					
Low	14.2	60.0	25.8	42.45	0.00* (2)
High	3.7	39.2	57.1		
<b>Presence of healthcare facilities in mother's community</b>					
No	9.5	47.1	43.4	1.94	0.00* (2)
Yes	8.4	42.1	49.5		

Index of Maternal Knowledge (IMK) scores: Low = 0-10; Medium = 11-20; High = 21-30; \*P < .001

As regard to the composition of social networks, women aged less than 25 chose as members of their social networks above all women from own families, especially elderly. Women more educated had in their social networks other members with a high level of education, especially graduated people. However,

two-thirds of women who were illiterate had at least one graduated member in their social networks. Most of members of their social networks were from in-laws or maternal family. Only 8% of the sample had a healthcare practitioner in their networks (Figure 2).



MILs: Mother-in-Laws; SILs: Sister-in-Laws; BFIL: Brother/Father-in laws

Figure 2. Composition of social networks in the population study (n = 379).

### *Association between level of maternal knowledge and variables of the study*

As showed in figure, the average score of the Index of Maternal Knowledge (IMK), as showed in figure 4, was 19.56 (DS  $\pm$  5.25). As

same village and different households, healthy people and active participation to social groups. Results showed that a high proportion of female ( $\beta = 0.038$ ,  $P < .01$ ), older people ( $> 50$  years) ( $\beta = 0.052$ ,  $P < .05$ ), people with a high level of education ( $\beta = 0.058$ ,  $P$

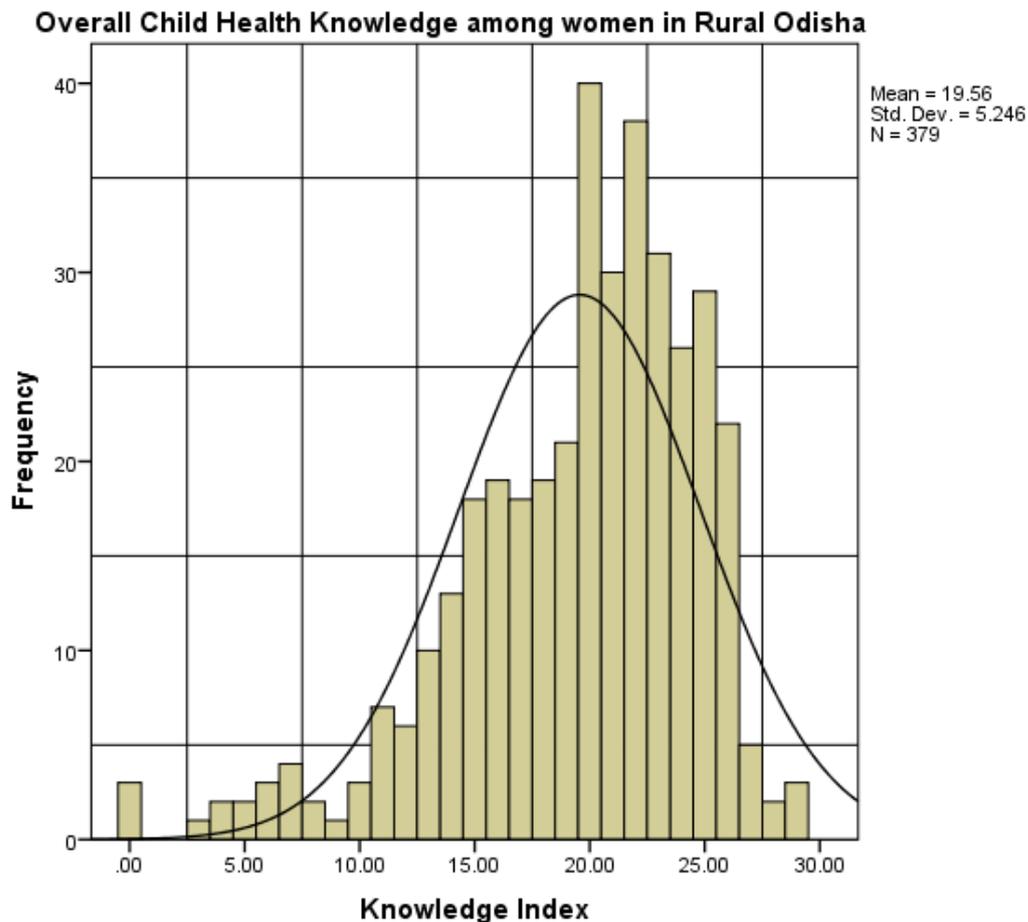


Figure 3. Index of Maternal Knowledge (IMK) scores in the population study ( $n = 379$ ).

showed in Table 2, the Chi square test revealed that high maternal knowledge was associated with different individual, network level and community characteristics (Table 2).

### *Analysis of predictors of maternal knowledge*

In order to study the effect of predictor variables, we used a multivariate analysis regression by applying a three-model regression (Tables 3a and 3b). One of three models included only social network characteristics, such as proportion of female members, old people (50 years or older), persons from the

$< .001$ ), and healthy people ( $\beta = 0.004$ ,  $P < .05$ ) within own social networks, and to be an active participant to social groups ( $\beta = 1.484$ ,  $P < .05$ ) were significantly and positively associated with maternal knowledge of child health. In the other two models, individual and household characteristics such as educational level of mothers, their exposure to media, type of caste and level of household wealth were significantly associated with the maternal knowledge. On one side, these variables showed a positive association, on the other side the scheduled tribes and scheduled castes showed a negative association with the

high level of maternal knowledge. The women with a 'Wealthy Index' calculated as 'Rich' ( $\beta = 2.18, P < .001$ ) or 'Middle' ( $\beta = 1.41, P < .05$ ) were significantly more likely to have higher level of knowledge than women considered as 'Poor' category. Similarly, it is found

that women with high exposure to media ( $\beta = 6.208, P < .001$ ) and low exposure ( $\beta = 4.78, P < .001$ ) to media are likely to have higher maternal knowledge than women without any exposure to media. The SCs/STs ( $\beta = -2.05, P < .05$ ) were significantly likely to have lower

Table 3a. Multivariate linear regression showing maternal child-health knowledge as variable dependent and individual, social-network and community-level characteristics as predictor variables.

Covariates	Model I	Model II	Model III
	$\beta$	$\beta$	$\beta$
Constant	13.199	4.679	5.881
<b>Individual Characteristics</b>			
Age		-0.054	-0.051
Marriage Duration		-0.010	-0.014
Educational Level		0.281***	0.284***
Type of Caste: SC/ST†		-2.049**	-2.007**
Type of Caste: Other Backward Classes		-0.364	-0.347
Wealth Index: 'Rich'		2.181***	2.169***
Wealth Index: 'Middle'		1.405**	1.355**
High exposure to media		6.082***	6.137***
Low exposure to media		4.783***	4.806***
<b>Social-Network Characteristics</b>			
Presence of females <sup>a</sup>	0.038*	0.007	0.008
Presence of people aged >50 <sup>a</sup>	0.052**	0.019*	0.019*
Presence of high-educated people (schooling >10 Years) <sup>a</sup>	0.058***	0.059**	0.057**
Presence of people from different HHs of the same village <sup>a</sup>	0.004	-0.008	-0.001
At least one healthcare provider <sup>a</sup>	0.004**	0.007*	--
At least one health care provider outside own community <sup>a</sup>	--	--	0.002*
Women engaged in at least one social group	1.484**	0.049	0.042
<b>Community Characteristics</b>			
Female literacy rate in the village		0.096*	0.093*
Proportion of SC/ST population		-0.034*	-0.034*
Proportion of households provided by electricity		0.040*	0.037*
Villages provided by Health Facilities		1.287***	1.308***
<b>Adjusted R-Square</b>	<b>22.6</b>	<b>55.5</b>	<b>55.03.00</b>

Note: \*\*\*P < .001; \*\*P < .05; \*P < .01. a Presence (or absence) within own social support network. SC: Scheduled Castes; ST: Scheduled tribe.

health knowledge in comparison with other caste groups. Individual and household characteristics like age ( $\beta = -0.05$ , ns) and marriage duration ( $\beta = 0.01$ , ns) were found to be unrelated to maternal health knowledge of respondents in this study area. Finally, social-networks characteristics such as the high proportion within social networks of high-educated members ( $\beta = 0.06$ ,  $P < .001$ ), female ( $\beta = 0.04$ ,  $P < .01$ ), older ( $\beta = 0.05$ ,  $P < .05$ ), and healthcare provider ( $\beta = 0.01$ ,  $P < .01$ ) were found to be positively related to overall maternal knowledge. A low female literacy

In order to study the effect of social-network characteristics on maternal child-health knowledge of low and high-educated women, we used a simple linear regression on two groups of women: a low-educated group including mothers who were illiterate or with primary education and a high-educated group including mothers with secondary education or above (Table 3b). The findings showed that a high proportion of females ( $\beta = 2.68$ ,  $P < .05$ ), high- educated members ( $\beta = 0.59$ ,  $P < .05$ ), and at least one healthcare provider ( $\beta = 0.33$ ,  $P < .05$ ) within own social-network

Table 3b. Effect of network characteristics on maternal child-health knowledge for high and low-educated mothers.

Covariates	Maternal Health Knowledge	
	Illiterate or Primary school	Secondary school or degree
<b>Social-networks Characteristics</b>		
Presence of females <sup>a</sup>	2.684 (0.64, 4.73)**	-1.353 (-3.011, 0.306)
Presence of people aged > 50 years <sup>a</sup>	0.39 (-1.16, 1.94)	0.997 (0.071, 1.923)**
Presence of high-educated people (schooling >10 years) <sup>a</sup>	0.59 (-0.76, 1.93)**	0.095 (-0.81, 0.999)
At least one healthcare provider <sup>a</sup>	0.33 (-1.11, 1.77)**	-0.518 (-1.541, 0.504)
Participation to at least one social group	9.98 (1.54, 18.42)**	-0.452 (-1.95, 1.047)
<b>Adjusted R-Square</b>	<b>54.4</b>	<b>30.2</b>

\*\*\* $P < .001$ ; \*\* $P < .05$ ; \* $P < .01$  <sup>a</sup>Presence (or absence) within own social support network.

Beta values are adjusted for individual age and exposure to media, and for type of caste and category of household wealth.

rate within the community was significantly related to a lower maternal health knowledge. The results of this model showed that community characteristics like proportion of households with electricity ( $\beta = 0.04$ ,  $P < .01$ ) and villages provided by healthcare facilities ( $\beta = 1.29$ ,  $P < .001$ ) were positively related to a high level of maternal health knowledge.

*Effect of social-network characteristics on maternal child-health knowledge of low and high-educated women and difference in levels of maternal child health knowledge between low and high-educated mothers*

were statistically significant associated with a high level of maternal child-health knowledge in low-educated mothers. In addition, low-educated mothers' knowledge was statistically significant ( $\beta = 9.98$ ,  $P < .05$ ) associated with active engagement in social groups. On the contrary, this association was not highlighted in case of high-educated mothers, with exception of an association revealed between people aged > 50 as own network's members and maternal child-health knowledge. Therefore, it was found that network members have more influence for determining maternal child-health knowledge in low-educated than

in high-educated mothers. This result was enhanced by our qualitative survey through face-to-face and semi-structured interviews. For instance, a-35-years-old mother who was illiterate stated: *“I prefer modern medicine for my child. But before going to hospital I and other mothers from the village ask Mr X, who has good knowledge of child health issues, some questions concerning, for example, which doctor it’s better to consult”*. While a-29-years-old mother with a high-level of education declared: *“Our neighboring knows a lot of information about traditional (herbalism) medicine. When my child suffers from diarrhea or fever she often helps me”*. An other 33-year-old mother with a low-level of education revealed: *“Self-Help Groups are not only useful to discuss about financial or working issues, but there I can also discuss with other mothers about our children’s heal-*

*childcare issues [35], our research showed that old-age women as social-support network members can help younger mothers through their suggestion and advice. Moreover, the presence of healthcare providers in mother’s social support networks was associated with a better level of maternal child-care knowledge. This finding is consistent with a study carried out in southern India, where authors stated that big and literate social networks are associated with better child nutrition, especially among the poor [50]. In Mexico, some studies [51] highlighted that mothers with support of close social network members are more compliant with medical recommendations for infant feeding, and a high proportion of healthcare providers and high-educated friends among social-network members is strictly related to best maternal knowledge*

**Table 4.** Unpaired T test for comparing levels of maternal child health between low and high-educated mothers.

p-value	t	Mean Difference	95% C.I.	
			Lower	Upper
0.00*	- 11.69	- 5.74	- 6.70	- 4.77

th and education. This needs to improve our knowledge of childcare issues”. Finally, an unpaired T test showed a statistically significant difference in levels of maternal child health knowledge between low and high-educated mothers (Table 4).

**DISCUSSION AND CONCLUSION**

The findings of our study were consistent with many past studies that, worldwide, showed a constant association between high levels of maternal child-care knowledge and high levels of maternal education, high household wealth percentile and prolonged mother’s exposure to mainstream media [3, 49]. Our multivariate analysis found that some mother’s social-network members such as high-educated, female and old-age people, and healthcare providers are positively associated with high levels of maternal knowledge of child health. In accordance with certain studies focusing on the positive influence of grandmothers on

about preventive and curative child-health issues. As showed by Laupani et al., therefore, social support received by own network members could turn in benefit for children [52]. Furthermore, our study showed that engagement in social groups could positively influence maternal child-health knowledge regardless of socio-economic factors. Indeed, network’s members had a more significant positive influence on low-educated mothers than on high-educated women. For this reason, researchers should be cautious before assuming that mother’s high levels of education invariably lead to an increased level of child health. As showed in our study, social support networks composed by household members, and interpersonal relationships such as, for instance, friends and female figures like grandmothers could be more important than mother’s educational level in this rural area of India as well as other rural regions of India

or developing countries. A high level of health-knowledge given from family members could also offer a substantial contribution to children's education. Moreover, taking advice from own friends and acquaintances through informal communication could give a greater value to the learning process. The important role of social support networks on maternal knowledge of child-health is consistent with past studies that consider social networks as powerful disseminators of knowledge and, more importantly, this type of knowledge can lead to positive changes in mother's behavior, for example with regard to fertility awareness and family planning [28, 53-55]. It is well-known that social relationships –both quantity and quality– affect mental health, health behaviour, physical health, and mortality risk, according to three ways that influence health: behavioural, psychosocial, and physiological [32]. Probably, people can enrich new ideas or innovations through their social relationships; for instance, some demographic studies showed the important role of social networks in online information diffusion about fertility and contraception [28, 56, 57]. In 1989, Kutty showed that high-educated husbands, who belong to mother's social support network, were more likely to improve attitude towards childhood immunization [58]. However, little research exists on mother's social support networks considered as an important tool for diffusing and improving knowledge about their children's health and nutrition status. Montgomery (2000) showed that well-educated networks through both the 'weak ties' and 'stronger ties' can help individuals with low socioeconomic level in acquiring important health messages [37, 59]. This study revealed that a large proportion of women could seek and receive some advices from individuals of their social networks. Indeed, many women could contact some educated people of their community to address different childcare issues. Therefore, in addition to individual characteristics and interpersonal networks, community can play a significant role in acquiring health knowledge, because it produces a positive influence on the first two components.

A lot of demographic research highlighted how the characteristics of the community can have a significant impact on human health in high-income settings [60-62]. However, literature that focused on positive effects produced by community on children's health in developing countries is scarce [47, 63-65]. The most strength of our study is because, to our knowledge, no prior study had ever explicitly examined how the community context may influence people's knowledge about the childhood diseases, which is directly related to children's health outcomes and their mortality rate. Some studies by applying the multilevel model, found that community-level health literacy and community-based socioeconomic and development measures could have a strong effect on children's health outcomes [63-68]. However, there is a considerable heterogeneity across studies in terms of how the community context is measured, and which community-level covariates can have a significant effect on maternal knowledge of children's health and nutrition outcomes. In our multivariate analysis, some community characteristics like availability of electricity and healthcare facilities were also associated with overall mother's knowledge of child-health. Probably, availability of electricity is important in order to receive some health messages from mainstream media such as TV, radio, etc., while healthcare facilities are not only useful for a cure but also for seeking medical advice that can enhance mother's levels of health-knowledge. There are many studies in developing and well-developed countries showing that high-educational level of community, proximity to the healthcare facilities and high exposure to mass media campaigns can positively affect people's knowledge of health and, subsequently, improve their behaviour [47, 61-63]. Therefore, we can hypothesize that well-educated and expert networks members can influence women's knowledge of nutritional and other childcare practices. However, our study has some limitations. Indeed, due to the cross-sectional study design, any causal relationships cannot be established. In conclusion, as showed by Kutty [58]

who did not find any differences in health and nutritional knowledge among women with different levels of education, our study highlighted that maternal knowledge of child health could depend not only on levels of mother's education, as many studies showed, but also on the presence of an effective social support network based on own family members, and some community-based characteristics. Although further research is needed in order to

explain how educational level, socio-economic factors and social-support network, and community interact one another to influence levels of maternal knowledge, our study paves the way to other research in order to suggest to policymakers more effective measures for promoting maternal knowledge and child well-being.

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