

## Original Research



## Determinants of maternal knowledge on developmental milestones of children attending immunization clinics in the district of Colombo, Sri Lanka

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DOI: <https://doi.org/10.4038/jccpsl.v23i2.8093>

Received on: 7 January 2017

Accepted on: 29 June 2017

### Abstract

**Background:** It is accepted that a good start at the beginning of life makes a child to be an efficient person of the society, hence the first five years is a crucial period of child's growth and development. Therefore, the mother should have adequate knowledge about child's development.

**Objective:** To assess the knowledge on developmental milestones and its determinants among mothers of eighteen-month old children in Kolonnawa and Dehiwala Medical Officer of Health (MOH) areas in the district of Colombo.

**Methods:** A descriptive cross-sectional study was conducted among 421 mother-child pairs of 18-months attending government immunization clinics. All study participants who are eligible were taken into the study. An interviewer-administered-questionnaire was used to assess knowledge on the assessment of developmental milestones on a pre-determined scoring system and its potential determinants. Univariate and multivariate analyses were performed.

**Results:** Knowledge on the assessment of developmental milestones was 'good' among 74% of mothers. Unmarried, divorced and separated mothers were 10 times more at risk for poor knowledge compared to married women (OR=10.3; 95% CI=1.9, 55.4). Mothers living in nuclear families were 2.5 times more likely to be less knowledgeable than the others (OR=2.5; 95% CI=1.4, 3.3). Higher-educational-level of mothers showed a significant protective effect (OR=0.6; 95% CI=0.3, 0.9). A higher proportion of mothers who had no access to formal health information had poor knowledge on developmental milestones, showing a 2.5 fold risk than mothers who gained formal health information (OR=2.5; 95% CI=1.1, 6.0). However, only 2.7% utilized the child health development record (CHDR) for getting information on child's development.

**Conclusions:** A majority of mothers had good knowledge on the assessment of developmental milestones. Mothers should be encouraged to utilize the CHDR and should emphasize the importance of recording milestones. Vulnerable population such as unmarried, divorced/separated mothers and mothers living without family support need targeted education.

**Key words:** developmental-milestones, mothers' knowledge, formal and informal information, nuclear and extended family

## Introduction

Children have invariably occupied an important position in the society since they reflect hope and future of a country (1). The United Nations charter for rights ensures the right of a child to grow up healthily, well nourished, protected from harm and abuse, with a sense of identity, self-worth and dignity, as well as with freedom and opportunities for learning. This includes childcare, education and parent support during the early years of life (2). Appraisal of these developmental milestones and providing age appropriate developmental stimulations were imperative constituents of early child care and development (ECCD).

Developmental milestones are the functional skills or tasks that children are capable of doing at certain ages in relation physical, cognitive, social, emotional and language domains (1). Knowledge in assessment of constituents had been deliberated in literature among parents especially of mothers. It is generally accepted that a good start at the beginning of life enables a child to be an efficient person of the society as the first five years is a crucial period for child's growth and development. Since mother is usually the master of child rearing, it is important to create awareness among mothers about childhood development (1, 3). Especially at 18 months of age, it is possible to screen children for complex skills that may be difficult to elicit earlier (4). It is possible to screen for major, moderate and possibly minor defects in hearing, vision and language development as well by 18 months (5). It is also an age, which is early enough to intervene effectively (6).

A study done in Turkey to assess the knowledge of mothers on young child development showed that mothers believed that most developmental skills and activities should occur at later than normative ages. Higher maternal education and lower number of children were found to be independent predictors of higher knowledge scores. The final results illustrate the degree to which caregivers or parents from Turkey may be lacking information on early childhood development (7). In concurrence, several other studies have shown that teenage mothers' knowledge on developmental milestones of their children was poor compared to non-teenage mothers (8-10). Poverty and low socio-economic status were found to be associated with poor maternal knowledge (11-12). In addition, maternal experience was related to parental knowledge. Primi mothers had less knowledge of child development than multipara mothers (12). Similarly, education of the

mother is vital in parenting during the formative period of the child as evident in studies done in low- and middle-income countries (13-14). In contrast, a study done in South Asia, particularly in rural India revealed that 53% of mothers having infants had good knowledge regarding developmental milestones. No significant association was found between maternal knowledge and age, parity, education, occupation, monthly family income, source of information, place of living and number of children of the study sample (1).

A study done by Rupananda (15) in a local setting revealed that gaining knowledge from a health care worker was 67.5% while it was 30% from a non-health care worker. More than 79% of parents have participated in awareness programs. Public health midwives (PHMs) were the main resource personal of disseminating knowledge. It seems that there are other determinants of knowledge to be studied more in a local setting. Therefore, the objective of this study was to assess the knowledge and its determinants on developmental milestones among mothers of 18-month old children attending immunization clinics in two selected MOH areas in Colombo District. Results of this study will identify gaps in the service delivery and produce valuable information that will be beneficial in implementation of advocacy programmes and to engage in further research to improve child's development and care.

## Methods

A clinic-based cross-sectional study was carried out among mothers attending the immunization clinics in Kolonnawa and Dehiwala MOH areas. The study population consisted of mother-child pairs (children who had completed 18 months of age attending immunization clinics for vaccination) living in the two randomly selected MOH areas for more than a year. Immunization clinics conducted by the PHM are held fortnightly in each of these two MOH areas. Pre-term babies, those with birth or neonatal complications such as congenital diseases, syndrome and seizer disorders, and mothers with diagnosed psychiatric illnesses were excluded from the sample.

The minimum required sample size was 421 based on an expected proportion of mothers having good knowledge in identifying developmental milestones of 53% (1), 95% confidence limits, 5% precision and 10% non-response (16). Since the average number of children who had completed 18 months of age attending any clinic session was only 10 in both MOH areas, all eligible

mother-child pairs during the time of data collection were recruited for the study.

A pre-tested interviewer-administered questionnaire was used to collect data by two pre-intern medical officers and five retired PHMs. Informed written consent was obtained prior to data collection. The questionnaire included socio-demographic and economic characteristics, source of information to identify how the mothers get information regarding childhood development (formal health information provided by health care workers or obtained through informal ways from their parents, in-laws, peers, neighbours and media). Finally, assessment by mother of her child's current developmental milestones was identified using a standard check list. This 26-item checklist was developed by the Center for Disease Control and Prevention (CDC) for rating mothers on their knowledge on developmental milestones in four domains: social -11 items, cognitive -5, motor -6 and language -4 (17). The tool underwent translation and back-translation process and was validated based on expert opinion to improve validity. The tool was pre-tested in Panadura MOH area followed by further modifications. Responses for each item were 'yes', 'no' and 'don't know'. One mark was given for each correct answer. These marks within each domain were converted to 100 and mothers who obtained more than 50% were considered as having 'good' knowledge in the assessment of that particular developmental domain. The total cumulative score of all four domains ranged from zero to 26 and the total mark was converted to 100. The assessment of developmental milestones by mothers was considered as 'good' if she has obtained an average over 75%. The CDC cut offs were used to categorize the knowledge.

Data were analyzed using Statistical Package for Social Science (SPSS) version 17 software. Univariate analysis was performed for all variables using unadjusted odds ratio and 95% confidence interval (95% CI). Of these, the significant ones were included as independent variables in multivariate analysis. Ethics clearance was obtained from the Ethical Review Committee of the Postgraduate Institute of Medicine, University of Colombo. Any child who was detected to have previously unidentified developmental problems were referred appropriately.

## Results

Of the 421 mother-child pairs who were eligible, seven did not give consent for the study giving a response

rate of 98.3% (414/421). Seventy percent of mothers were from Kolonnawa and the rest from Dehiwala MOH areas.

Table 1 shows the socio-demographic characteristics of mothers. Almost half of the sample of mothers belonged to 21-30 age category (n=210, 50.7%). Mean age of the mothers was 29.7 (SD=5.72) years. The majority of mothers were Sinhalese (n=269, 65%), married (n=404, 97%) and were living in nuclear families (n=275, 66%). Nearly half were first time mothers (n=208, 50.2%). Considering the highest level of education, 30% of mothers had passed G.C.E. Ordinary Level (O/L) while 33.6% had studied beyond O/L. Only 16.2% of mothers were employed.

Knowledge on the overall assessment of developmental milestones was 'good' among 73.9% of mothers while more than 75% of mothers showed 'good' knowledge in each domain as well (Table 2). Out of the four domains, the proportion of mothers who had good knowledge was in motor domain (89.4%) followed by language (85.5%), cognitive (83.6%) and social domain (78%). Knowledge score for motor domain ranged from 1-6 (mean=4.5, SD=0.8), cognition 1-5 (mean=4.9, SD=0.9), language 0-4 (mean=3.3, SD=0.8), social 2-11 (mean=7.8, SD=1.6). The total score ranged from 6-25 (mean=19.8, SD=2.8).

With regards to source of information, more than 90% of mothers had formal health information (n=380, 93.6%) while PHM home visit played a vital role in providing this knowledge (65%, n=261). Antenatal clinic visits and MOH provision of knowledge were 10.2% and 6.9%, respectively. Only 2.7% (n=12) of them obtained information regarding developmental milestones from the CHDR. Nearly 80% of mothers obtained health information (n=326, 81.5%) through informal sources such as parents (72.4%), peers (9.8%) and media (6.1%) (Table 3).

Table 4 describes the determinants of poor knowledge of mothers on the assessment of developmental milestones. Unmarried, divorced or separated mothers had poor knowledge compared to married women, with 6.8 fold risk than their counterpart (OR=6.8; 95% CI=1.4, 33). Similarly, mothers with nuclear families had poor knowledge and were 1.7 times more likely to be less knowledgeable than mothers in extended families (OR=1.7; 95% CI=1.1, 2.6). Proportion of mothers who did not obtain formal health information had poor knowledge, and were 2.7 times less knowledgeable than

**Table 1. Demographic and socio-economic characteristics of the mothers**

Characteristic	No.	%
<b>Age group (years)</b>		
≤ 20	23	5.6
21 to 30	210	50.7
31 to 40	165	39.9
> 41	16	3.9
<b>Ethnicity</b>		
Sinhala	269	65.0
Tamil	64	15.5
Muslim	76	18.4
Burger	5	1.1
<b>Current marital status</b>		
Never married	2	0.5
Married	404	97.6
Separated/ Divorced	8	1.9
<b>Highest educational level</b>		
No formal education	6	1.5
Grade 1 to 5	11	2.7
Grade 6-11	134	32.4
Passed G.C.E O/Level	124	30.0
Passed G.C.E A/Level	104	25.1
Higher education	35	8.5
<b>Current occupation</b>		
Not employed	345	83.3
Administrative	10	2.4
Professional	27	6.5
Clerical and services	18	4.3
Skilled/ Semi-skilled	8	1.9
Unskilled	6	1.4
<b>Average monthly income</b>		
Rs. 5000 - 10,000	21	5.1
Rs. 10,001 - 20,000	138	33.3
Rs. 20,001 - 30,000	115	27.4
> Rs. 30,000	134	32.4
<b>Parity</b>		
Primi para	208	50.2
Multi para	206	49.8
<b>Type of family</b>		
Nuclear	275	66.4
Extended	139	33.6
<b>Total</b>	<b>414</b>	<b>100.0</b>

**Table 2. Level of knowledge of mothers on the assessment of developmental milestones**

Assessment	No.	%
<b>Overall</b>		
Good	306	73.9
Poor	108	26.1
<b>Social domain</b>		
Good	323	78.0
Poor	91	22.0
<b>Language domain</b>		
Good	354	85.5
Poor	60	14.5
<b>Cognitive domain</b>		
Good	346	83.6
Poor	68	16.4
<b>Motor domain</b>		
Good	370	89.4
Poor	44	10.6
<b>Total</b>	<b>414</b>	<b>100.0</b>

**Table 3. Source of information available for mothers on developmental milestones**

Sources of information	No.	%
<b>Formal health information<sup>1</sup> (N=381)</b>		
PHM Home visit	261	65.0
Antenatal clinic visit	42	10.2
Postnatal clinic visit	11	2.7
Antenatal classes	22	5.4
Medical officer of health	28	6.9
General practitioner	5	1.2
Child health development record	12	2.7
<b>Informal health information<sup>1</sup> (N=332)</b>		
Parents	236	72.4
In-laws	19	5.8
Peers	32	9.8
Neighbours	7	1.5
Media	22	6.1
Others	16	4.3

<sup>1</sup>Multiple responses

**Table 4. Factors associated with knowledge of mothers on developmental milestones**

Characteristic	Poor No. (%)	Good No. (%)	Unadjusted OR <sup>1</sup> (95% CI)	Adjusted OR <sup>1</sup> (95% CI)
<b>Age of mother (years)</b>				
Less than 30	76 (42.1%)	105 (57.9%)	1.3 (0.9-2.0)	1.3 (0.8-2.1)
30 and above	81 (35.1%)	152 (64.9%)	1.0	1.0
<b>Highest education level</b>				
Up to O/L	69 (45.7%)	82 (54.3%)	1.5 (1.0-2.4)	0.6 (0.3-0.9)
Beyond O/L	87 (33.1%)	176 (66.9%)	1.0	1.0
<b>Current occupation</b>				
Employed	30 (43.5%)	39 (56.5%)	1.3 (0.7-2.2)	0.6 (0.3-1.2)
Unemployed	126 (36.5%)	219 (63.5%)	1.0	1.0
<b>Monthly income</b>				
> Rs. 20,000	97 (38.9%)	156 (62.6%)	1.0 (0.6-1.5)	1.5 (0.8-2.6)
≤ Rs. 20,000	59 (37.1%)	100 (62.9%)	1.0	1.0
<b>Ethnicity</b>				
Non Sinhala	67 (37.9%)	110 (62.1%)	1.0 (0.6-1.5)	0.8 (0.5-1.3)
Sinhala	89 (37.6%)	148 (62.4%)	1.0	1.0
<b>Current marital status</b>				
Other	8 (80.0%)	2 (20.0%)	<b>6.8 (1.4-33)</b>	<b>10.3 (1.9-55.4)</b>
Married	148 (36.6%)	256 (63.4%)	1.0	1.0
<b>Parity</b>				
Multi	82 (39.8%)	124 (60.2%)	1.2 (0.8-1.7)	0.8 (0.5-1.4)
Primi	74 (35.6%)	134 (64.4%)	1.0	1.0
<b>Type of family</b>				
Nuclear	115 (41.8%)	160 (58.2%)	<b>1.7 (1.1-2.6)</b>	<b>2.5 (1.4-3.3)</b>
Extended	41 (29.5%)	98 (70.5%)	1.0	1.0
<b>Formal health information</b>				
No	20 (60.6%)	13 (39.4%)	<b>2.7 (1.3-5.7)</b>	<b>2.5 (1.1-6.0)</b>
Yes	136 (35.8%)	245 (64.2%)	1.0	1.0
<b>Informal health information</b>				
No	43 (49.4%)	44 (50.6%)	1.8 (1.0-2.9)	1.5 (0.8-2.6)
Yes	112 (34.7%)	133 (65.3%)	1.0	1.0

<sup>1</sup>Significant at 0.05 level

mothers who obtained formal health information (OR=2.7; 95% CI=5.7, 1.3). When considering the knowledge gained through informal sources, a slightly higher proportion of mothers who learnt from their parents had higher knowledge compared to others, although this observed difference was not statistically significant (OR=1.8; 95% CI=1.0, 2.9). After controlling for possible confounders, these factors remained significant in the logistic regression model. Their adjusted odds ratios were: unmarried, separated or divorced women (adjusted OR=10.3; 95% CI=1.9, 55.4), mothers living in nuclear families (adjusted OR=2.5; 95% CI=1.4, 3.3) and mother who did not obtain formal health information (adjusted OR=2.5; 95% CI=1.1, 6.0).

## Discussion

The present research showed that 73.9% of mothers of children aged 18 months were having 'good' overall knowledge on how to assess development milestones of their children up to 18 months of age. Also, more than 75% of them demonstrated good knowledge within each domain of developmental milestones. In this study, the rural and estate sector mothers were not represented, and therefore, if results are generalized to other parts of Colombo district, the level of assessment will be much lower than the present level. In comparison, a study done in India among 100 mothers of infants selected from hospitals reported that only 53% of mothers had good knowledge on developmental milestones while the mean %knowledge score was 55.7% in language development followed by physical growth (53.2%), gross motor development (48.3%), fine motor development (46%) and least in social development (21%) (1).

Maternal education inversely affects the infant and child mortality and similarly, it has proven to be an important factor in child development. A cohort study conducted in Brazil has demonstrated that poorly educated mother could affect the cognitive stimulation of a child negatively (13). Another study by Aruna (14) in India has shown that maternal literacy could positively affect a child's psychological development. Our study does not however show an association between maternal education and knowledge on developmental milestones, which was similar to the findings of the study by Rupananda (15). Thus, it is noted in our study that more than 90% of mothers have had access to formal health information sources on developmental milestones, of which PHM's home visit seemed to play a vital role in providing knowledge (65%). PHM is the first person a

mother would contact at field level in the event of any developmental problem in a child. However, only 2.7% (n=12) reported that they gained information from the CHDR, which needs further attention of the healthcare planners.

There is substantial evidence on poverty and low socio-economic status being significantly associated with poor knowledge of mothers (10-11). A study done in Sri Lanka by Rupananda (15) demonstrated a similar association between good knowledge on developmental milestones and monthly income over Rs. 10,000 ( $p < 0.001$ ). However, socio-economic status was not a significant determinant in our study. In concurrence, a descriptive study done in a hospital setting in India too showed no association with mothers' socio-economic status (1). Sri Lanka provides free education for all and compulsory education up to 14 years of age irrespective of family income, thus the literacy rate especially among females is much higher compared to other countries in South Asia (18-19). Nevertheless, it is expected that teenage (8) and primi mothers (12) would have less knowledge than the others, owing to their shorter duration of maternal experience leading to less parental knowledge. However, these were not prominent as determinants in our study. It may be that our primi mothers regularly attend antenatal clinics and actively participate in antenatal classes, and thereby having equal knowledge compared to non-primi mothers.

Of all the demographic and socio-economic factors studied, the only two determinants of poor knowledge in our study were being unmarried/divorced/separated and living in a nuclear family. In the Sri Lankan culture, married mothers living in extended families always receive ample support in child rearing from their spouse, parents, in-laws and siblings. This raises the concern whether unmarried, separated or divorced women are being socially marginalized or whether there are barriers in the maternal and child care service delivery system.

In considering the sources of information, a significant association was noted between mothers' knowledge and obtaining formal health information from the PHM. They did so during home visits (66%), conducting health education in antenatal clinics (10.2%), postnatal clinics (2.7%) and antenatal classes (5.4%). Higher level of knowledge could also be due to the high literacy of mothers in addition to being educated by the PHM. Further research should be carried out to assess the most preferred method of gaining knowledge and problems in

obtaining information from CHDR on developmental milestones. Apart from healthcare workers, parents are identified as the most influential persons in providing information related to child care practices. Parental experience in the past in identifying developmental abnormalities is highly valued by mothers. However, there was no significant association between mothers' knowledge and obtaining information informally from parents.

There were some limitations of this study. The sample is not representative of the entire Colombo district, and therefore the findings could only be applied to any other urban MOH setting in Sri Lanka. However, reduced age at marriage, high female literacy and lower employment rate among females and average per capita income were compatible with census data (18-19). There was no validated questionnaire for Sri Lanka to assess maternal knowledge on developmental milestones. However, the questionnaire was prepared using several sources of CDC, CHDR, hand books produced by child health unit of Family Health Bureau and questionnaire used by UNICEF. Ideally, this research should have been conducted at households where the child could be better observed and thereby assess whether mothers are capable of identifying the child's milestones accurately. This was not possible due to time and feasibility constraints.

### Conclusions and recommendations

Well over 70% of mothers had good knowledge on the assessment of developmental milestones. Marital status and type of family were the only socio-demographic factors that determined their knowledge, highlighting the need to target our service delivery for vulnerable populations such as unmarried, divorced and separated mothers, and mothers living without any family support. PHM imparted a positive influence on mother's knowledge on developmental milestones, signifying the importance of reinforcing the key messages on developmental milestones at each clinic visit.

#### Public health implications

Public health midwife has a major role to play in providing knowledge to mothers regarding child developmental milestones. For this purpose, she has to plan her activities targeting vulnerable mothers who do not utilize the existing health care system.

### Author Declarations

**Competing interests:** The authors declare that they have no competing interests.

**Ethics approval and consent to participate:** Ethics clearance was obtained from the Ethics Review Committee of the Postgraduate Institute of Medicine, Sri Lanka. Administrative clearance to collect data was obtained from the Regional Director of Health Services Colombo and MOH Dehiwala and Kolonnawa areas. Informed written consent was obtained from each study participant. Personal identification data were not included in the questionnaire.

**Funding:** None

**Acknowledgements:** We would like to express our gratitude to Dehiwala and Kolonnawa MOHs, their staff and study participants.

**Author contributions:** FF was the principal investigator of the study. FF & SG were involved in the concept, design and interpretation of data. FF was involved in data collection and drafting the manuscript. FF & SG revised it critically for important intellectual content and gave final approval.

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