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# MATERNAL KNOWLEDGE, ATTITUDES, AND PRACTICES AND HEALTH OUTCOMES OF THEIR PRESCHOOL-AGE CHILDREN IN URBAN AND RURAL KARNATAKA, INDIA

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## ABSTRACT

**Introduction:** Maternal knowledge, attitudes, and practices (KAP) impact child health. This evaluation, conducted by an organization providing health screenings at anganwadis (government-sponsored preschools) in south India, compared maternal KAP and health outcomes of their 2-5 year-old children.

**Methodology:** An interview schedule was developed based on the National Family Health Survey (NFHS-3) questionnaires for this cross-sectional study. The random walk method guided data collection. Urban and rural mothers were interviewed and anthropometric measurements of their children collected. Scores were calculated for maternal KAP and child health.

**Results:** Surveys were completed by 120 urban and 124 rural mothers. Mothers of children receiving health screenings had the highest mean attitude score. Children in convent schools were the healthiest, with the best child health scores, lowest incidence of ARI (12.7%) and diarrhea (5.5%), and the lowest prevalence of underweight (31.5%) and stunting (41.5%). Children not attending preschool had the highest incidence of diarrhea (25.0%) and greatest prevalence of stunting (59.4%).

**Conclusion:** This evaluation allowed an organization providing health screenings to rural anganwadi children to compare those they serve to children in nearby communities. Identification of key questions predicting maternal practice guides future interventions with mothers.

**Key Words:** Maternal knowledge, attitude, practice; child health, preschool, evaluation

## INTRODUCTION

Malnutrition among under-five children is a major public health problem in India and among the highest in the world.[1] Each year approximately 2.3 million deaths among 6-60 months aged children in developing countries are associated with malnutrition, which is about 41% of the total deaths in this age group.[2] Undernutrition is substantially higher in rural than in urban India. The prevalence of severely underweight was almost five times higher among children whose mothers have no education than among children whose mothers have 12 or more years of schooling and among mothers who were undernourished themselves than for children whose mothers are not undernourished. A study in India showed that women with higher autonomy (indicated by access to money and freedom to choose to go to the market) were significantly less likely to have a stunted

child when compared with their peers who had less autonomy.[3] As per Millenium Development Goals, India as to reduce the Under Five Mortality Ratio (U5MR) to 42 deaths per 1000 live births by 2015. As per Sample Registration System 2013, the U5MR is at 49 deaths per 1000 live births and as per the recent trend i.e., 1990 – 2013, the achievement is likely to be very close to the target.[4] Governmental preschools, called anganwadis, are available throughout India. Children may attend an anganwadi, a private English medium preschool (convent schools), or not attend preschool. Therefore, the health systems play an important role in early detection and implementing timely interventions at the community level and assess the effectiveness of the various approaches to combat malnutrition among under-five children. This study evaluated health outcomes of children receiving the health screenings; and identified gaps in maternal knowledge, attitudes, and practices (KAP) regarding ARI, diarrhea, and nutrition. Outcomes were compared among four preschool types: anganwadis with health screenings, anganwadis without health screenings, convent schools, and no preschool. Results informed program decision-making regarding anganwadi health screenings.

## MATERIALS AND METHODS

The concept map (Figure 1) illustrates the proposed relationships among study variables. Maternal KAP scores are influenced by social and economic determinants of health, such as living conditions and socio-economic status; education;[5,6] and possibly their child's preschool. Maternal KAP then influences the child's nutritional status, history (breast feeding, immunizations), and incidence of ARI and diarrhea. All of these factors combined influence child health outcomes.

This cross-sectional community-based survey was undertaken from March through May of 2009 in urban and rural areas in south India. Women, 18 years and older, who were mothers of two through five year-old children, and their respective children were eligible to take part in the study.

Sample size was determined based on prevalence data from a country-wide health survey in India, the National Family Health Survey (NFHS-3).[7] An oversampling of ten percent was included, resulting in a sample size of 108 rural mothers and children and 113 urban mothers and children. Mothers in the urban population were residents of an urban slum and the rural population lived in villages located near a rural clinic through which the community health providers worked and provided outreach.

A structured, pretested, and pilot tested interview schedule, based on NFHS-3 Women's Questionnaire[7] and the NFHS-2 Household Questionnaire[8] was administered. It was comprised of 113 individual questions (demographics; living conditions; knowledge, attitudes, and practices regarding ARI and diarrhea; nutritional practices; child breastfeeding and immunization history; school information; ARI and diarrhea recall). Anthropometric measurements (height, weight) of the two though five year-old child were taken whenever possible and were obtained for the majority of the children in the study.

The random walk method[9] was utilized to determine the path to canvas each area. A social worker familiar with the urban area and a community health worker (CHW) familiar with the rural area were trained in questionnaire delivery and anthropometric measurement procedures. They followed a path through their respective communities that was predetermined by the random walk. Data were collected during the regular work week (Monday – Friday during the day and Saturday morning).

**Table 1: Study Scores and Definitions**

| Score | Definition |
|---|---|
| Knowledge | Diarrhea knowledge score + ARI* knowledge score; diarrhea knowledge score=total number of points earned from diarrhea knowledge questions; ARI knowledge score=total number of points earned from ARI knowledge questions |
| Attitude | Diarrhea attitude score + ARI* attitude score; diarrhea attitude score=total number of points earned from diarrhea attitude questions; ARI attitude score=total number of points earned from ARI attitude questions |
| Practice | Diarrhea practice score + ARI* practice score + nutrition practice score; diarrhea practice score=total number of points earned from diarrhea practice questions, ARI practice score=total number of points earned from ARI practice questions, nutrition practice score=total number of points earned from nutrition practice questions |
| Child health | Sum of points earned from two-week and four-week recalls of diarrhea and ARI* and the duration of each; lower score indicates better health |

*ARI = acute respiratory infection, SES = socio-economic status

Points were awarded for each answer on the questionnaire and scores were calculated for: maternal knowledge, attitudes, and practices; maternal KAP overall (sum of knowledge, attitude and practice

scores); and child health. With the exception of child health, more desirable answers were awarded more points. Scores were calculated as continuous numerical variables and converted into categorical variables, "good" or "poor". A good score indicated that 70% or more of the potential points for that area were obtained. Scores are defined in Table 1.

Various statistical methods were used in data analysis, including, descriptive statistics, chi-square statistics, logistic and multiple regression. Analyses were conducted with SAS 9.0 statistical software.

The study was approved by an Institutional Review Board of a university in the United States and the Institutional Ethical Review Board of a medical college in India. Mothers who agreed to participate in the study signed an informed consent form in the local language, Kannada. Children provided assent, if possible (depending on age), before anthropometric measurements were taken.

## RESULTS

A total of 244 mothers and children took part in the study. Results were analyzed to obtain outcomes overall, by location (urban, rural), and preschool type. The study population was almost evenly divided between urban and rural locations. All of the Type One preschool mothers resided in the rural area while the majority of all other preschool types were urban. Table 2 displays the distribution of the participants by location and preschool type. Urban mothers were older as 37 (29.8%) were 18-23 year-olds and 25 (20.2%) were age 30 and older while 51 (42.5%) rural mothers were 18-23 and 12 (10%) were 30 years and older. Overall, urban mothers were less educated: 83 (66.9%) and 95 (79.2%) of urban and rural mothers, respectively, completed sixth standard or higher; 21(16.9%) and 12 (10%) of urban and rural mothers, respectively, had no formal education. Mothers in both locations tended not to work outside of the home: 99 (79.8%) and 104 (89.7%) of urban and rural mothers, respectively, were unemployed.

### Maternal Knowledge, Attitudes, and Practices

Scores were calculated for maternal knowledge, attitudes, practices, and KAP overall. Higher scores indicate more desirable results. Knowledge scores were similar among all groups, ranging from 32.01 to 32.92. Attitude scores had the widest range, with urban mothers having lower attitude scores (19.83) than rural mothers (24.59) and Type One mothers having the highest attitude scores (24.65) of all the preschool types. Practice scores were highest among Type Three (45.92) and lowest among Type One (44.31) mothers. Maternal knowledge, attitude, and practice scores are displayed in Table 3.

Chi square analyses were conducted to compare dichotomized KAP scores ("good" vs. "poor"). Comparisons included poor knowledge versus poor practice, poor knowledge versus poor attitude, and poor attitude versus poor practice. For the entire study sample, poor knowledge was significantly associated with poor attitude [$\chi^2$ (1, n = 244) = 5.3283, p = .0210] and poor knowledge was significantly associated with poor practices [$\chi^2$ (1, n = 244) = 19.2956, p = <.0001. Among subgroups of the study population, poor knowledge was significantly associated with poor attitude among the urban mothers [$\chi^2$ (1, n = 124) = 12.55, p = .0004), Type Two mothers [$\chi^2$ (1, n=56) = 4.79, p = .0286] and Type Four mothers [$\chi^2$ (1, n = 80) = 10.21, p = .0014). Poor knowledge was significantly associated with poor practice among the urban mothers [$\chi^2$ (1, n = 124) = 21.59, 1, p < .0001), Type 2 [$\chi^2$ (1, n = 56) = 3.91, p = .0481], Type Three [$\chi^2$ (1, n = 55) = 6.43, p = .0112), and Type 4 [$\chi^2$ (1, n = 80) = 12.15, p = .0005) preschool mothers. Finally, poor attitude was significantly associated with poor practice among urban [$\chi^2$ (1, n = 124) = 15.41, p <.0001) and Type Four [$\chi^2$ (1, n = 80) = 8.03, p = .0046] preschool mothers.

**Table 2: Study population by location and preschool type (n=244)**

| Location | Type 1* | Type 2 † | Type 3‡ | Type 4§ | Total |
|---|---|---|---|---|---|
| Urban | 0 | 32 | 30 | 62 | 124 |
| Rural | 53 | 24 | 25 | 18 | 120 |
| TOTAL | 53 | 56 | 55 | 80 | 244 |

*Serviced anganwadi; †Regular anganwadi; ‡Convent school; §No preschool

Additionally, multiple regression analysis was performed to determine the knowledge and attitude questions that best predicted practice. Three ARI knowledge questions, four diarrhea knowledge questions, and three diarrhea attitude questions significantly or marginally significant predicted maternal practices. Mothers were asked: *Which of the following can contribute to your child having a cough, runny nose, blocked nose, or problems with his/her chest?* Mothers replied yes, no, or I don't know to a list of responses. Responses identified as predictors of practice included: cooking inside with fire (PE = 1.8415, SE = 0.7423, p = .0138), audible respiratory sounds (PE = 3.2462, SE = 1.2770, p = .0117), and breath count decreases (PE = -2.2398, SE = 1.1654, p = .0559). Following the same format, mothers were also asked: *Which of the following can contribute to your child having diarrhea?*

Responses predicting maternal practice included: Disposal of child's stool (PE = .7463, SE = 0.1289, p < .0001), hydration for child with diarrhea (PE = 0.7485, SE = 0.1388, p < .0001), God (PE = 1.8027, SE = 0.8904, p = .0441), and unclean food (PE = 2.1238, SE = 1.0889, *p* = .0524). Mothers were asked to rate the importance of concepts and actions as they related to their child's health on a four-point scale (an "I don't know" option was also available). Attitudes that predicted practice included the importance of: Clean drinking water (PE = 7.9513, SE = 3.1248, p = .0116), eating fresh food (PE = 7.3649, SE = 3.2631, p = .0250), and stool disposal (PE = 0.7614, SE = 0.3246, *p* = .0198).

**Table 3: Maternal KAP scores by location and preschool type**

| Score (Possible range) | Overall (n=244) | Urban (n=124) | Rural (n=120) | Type 1* (n=53) | Type 2† (n=56) | Type 3‡ (n=55) | Type 4§ (n=80) |
|---|---|---|---|---|---|---|---|
| Knowledge (15.5-40) | 32.38 (23-38) | 32.42 (23.5-38) | 32.34 (23-36.5) | 32.01 (23-35.5) | 32.46 (24-38) | 32.92 (23.5-37) | 32.21 (24-37) |
| Attitude (6-30) | 22.17 (6.2-28.2) | 19.83 (6.2-28.2) | 24.59 (19.7-25.6) | 24.65 (19.7-25.3) | 21.95 (6.3-28.2) | 23.06 (9.9-27.3) | 20.07 (6.2-28.2) |
| Practice (1.6-60) | 44.87 (28.2-55.8) | 45.31 (30.2-55.4) | 44.44 (28.2-55.8) | 44.31 (28.2-55.8) | 44.89 (33-55.4) | 45.92 (29.4-55.6) | 44.54 (30.2-54.5) |

All data indicate mean value. Figure in parenthesis indicate range.
*Serviced anganwadi; †Regular anganwadi; ‡Convent school; §No preschool

**Table 4: Child health scores by location and preschool type**

| Score (Possible range) | Overall (n=244) | Urban (n=124) | Rural (n=120) | Type 1* (n=53) | Type 2† (n=56) | Type 3‡ (n=55) | Type 4§ (n=80) |
|---|---|---|---|---|---|---|---|
| Child health‖ (8-40) | 10.49 (8-36) | 10.22 (8-22) | 10.76 (8-36) | 10.92 (8-25) | 9.88 (8-24) | 9.87 (8-36) | 11.07 (8-24) |

All data indicate mean value. Figure in parenthesis indicate range.
*Serviced anganwadi; †Regular anganwadi; ‡Convent school; §No preschool; ‖Lower scores indicate better health

**Table 5: Child health outcomes by location and preschool type**

| Outcome | Urban (%) (n=124) | Rural (%) (n=120) | Type 1* (%) (n=53) | Type 2† (%)(n=56) | Type 3‡ (%)(n=55) | Type 4§ (%)(n=80) |
|---|---|---|---|---|---|---|
| ARI‖¶ | 16(12.9) | 24(20.0) | 12(22.6) | 8(14.3) | 7(12.7) | 13(16.3) |
| Diarrhea¶ | 21(16.9) | 11(9.2) | 3(5.7) | 6(10.7) | 3(5.5) | 20(25.0) |
| Underweight** | 48(41.7)(n=115) | 44(37.6)(n=117) | 20(39.2)(n=51) | 22(39.3)(n=56) | 17(31.5)(n=54) | 24(33.8)(n=71) |
| Stunted†† | 50(44.3)(n=113) | 72(61.5)(n=117) | 28(53.9)(n=52) | 31(55.4)(n=56) | 22(41.5)(n=53) | 41(59.4)(n=69) |

*Serviced anganwadi; †Regular anganwadi; ‡Convent school; §No preschool; ‖Acute respiratory infection
¶Based on maternal recall for two weeks prior to survey; **Weight-for-age <2SD from the mean of the reference group; ††Height-for-age <2SD from the mean of the reference group

### Child Health

Mothers were asked to recall the occurrence of ARI and diarrhea for their child for the two weeks prior to the survey. Nutritional status, measured through weight-for age (WFA) and height-for-age (HFA), was calculated by age group: 24-60 months and 61-72 months. Underweight is indicated by WFA, and stunting is indicated by HFA.

Child health scores resulted from the sum of points earned from two-week and four-week recalls of diarrhea and ARI, and the duration of each. Lower child health scores indicate better health. Child health scores for urban children were better than those for rural children, with a mean of 10.22 and 10.76, respectively. Type Two and Type Three children had the best child health scores, with a mean of 9.88 and 9.87, respectively; and Type Four children the worst with a mean of 11.07. Scores by subgroup are displayed in Table 4.

Child health outcomes – incidence if ARI and diarrhea, and prevalence of underweight and stunting – varied by location and preschool type. Urban children had a higher incidence of diarrhea (16.9%) and prevalence of underweight (41.7%), while rural children experienced a greater incidence of ARI (20%) and prevalence of stunting (61.5%). Health outcomes also varied by preschool type. The highest incidence of ARI occurred among Type One children. Type One and Type Two children had the highest prevalence of underweight, and Type Four children had the highest prevalence of diarrhea and stunting. Type Three children experienced the lowest incidence of ARI and diarrhea, and lowest prevalence of underweight and stunt-

ing. Table 5 displays child health outcomes by location and preschool type.

### Maternal KAP and Child Health

Logistic regression equations modeled the outcomes "ARI in the last two weeks" and "diarrhea in the last two weeks" according to the parameters knowledge, attitude, and practice scores; and location (urban, rural). For Type Three mothers location statistically significantly predicted ARI in the last two weeks (OR = 11.125, 95% CI (1.128-109.77), SE = 1.1680, p value = .0391). Diarrhea was predicted by the maternal practice score overall (OR = 1.105, 95% CI (1.023, 1.194), SE = 0.0395, p value = 0.0111) and among type 4 mothers (OR = 1.120, 95% CI (1.010 - 1.251), SE = 0.0562, p value = .0432).

Logistic regression was used to model underweight/severely underweight as an outcome of knowledge, attitude and practice scores; and location (urban vs. rural). Among Type One mothers, the practice score (OR = 1.126 (1.002-1.265), $p$ = .0461) and attitude score (OR = 0.856 (0.729 – 1.005), $p$ = .0573) statistically significantly, or marginally so, predicted underweight/severely underweight among their children. Additionally, among Type Three mothers, rural location predicted underweight/severely underweight among their children (OR= 0.144 (0.042 – 0.493), $p$ = .0020).

## DISCUSSION

Overall, knowledge scores were similar among mothers for all preschool types. Attitude scores were the highest and practice scores the lowest among Type One mothers, indicating that mothers of children attending serviced anganwadis may be more receptive to an educational intervention aimed to improve maternal practices.

In analyzing the outcomes of poor knowledge versus poor practice, poor knowledge versus poor attitude, and poor attitude versus poor practice, some chi square statistic results were statically significant but not consistently across all preschool types. The associations that do exist support findings in the literature that maternal knowledge is associated with child care practices.[10-15] This also aligns with the finding that decreased knowledge leads to decreased levels of practice.[14,15]

Preschool type did not predict *good* KAP scores. However, maternal education was significantly associated with *good* KAP scores, adding to the literature that maternal education positively influences child care practices.[10,11,13,15,17,18,19]

Diarrhea and ARI were more prevalent in this study than expected. According to the NFHS-3, diarrhea in the urban and rural areas of Karnataka was 9% and 8.4%,[16] respectively, while this study found 16.9% and 9.2% for the urban and rural areas, respectively. Prevalence varied by preschool type, ranging from 5.5% up to 25%. Prevalence of ARI was much higher than expected as well. Prevalence of ARI in the NFHS-3 was 1.8% and 1.7% among urban and rural populations in Karnataka,[20] respectively. Prevalence of ARI ranged from 14.3% to 22.6%. This study used an expanded definition of ARI which included runny nose, which may account for the higher than expected prevalence of ARI.

The prevalence of underweight among children in this study was similar to that of the state of Karnataka (38%).[20] Interestingly, children attending anganwadis (Type One and Type Two children) experienced the highest prevalence of underweight when compared to children attending convent schools or no preschool at all.

Maternal knowledge has been found to be important in terms of practices related to diarrhea and ARI among children.[10-17,21,22] This study found no statistically significant relationship between knowledge and these health outcomes, but practice scores were significantly related to diarrhea in the last two weeks overall (p=.0111) and among Type Four mothers and children (p=.0432).

While maternal knowledge regarding infections, nutrition, and hygiene has been found to be crucial to corresponding practices impacting child health directly and indirectly,[10-17,21,22] maternal knowledge and attitude scores did not significantly predict the nutritional status of the children (underweight/severely underweight). Among mothers in Type One mothers, practice scores were statistically significant predictors of underweight/severely underweight (p=.0461), as has been established in the literature.[23-25]

### Limitations

The study area was selected as an area of convenience, but this was corrected for by randomly selecting the streets/path of the random walk through the urban areas and rural villages. Data were collected during the standard work week during the day, so mothers working during this time were systematically excluded from the study. The *good* score cut-off of 70% was arbitrarily chosen and may not represent a natural division between good and poor levels of knowledge, attitudes and practices. Resources did not allow for the study to be sufficiently powered to stratify by preschool type, so significant results may not have been found where they actually exist, but the

study sample size was calculated to stratify by urban and rural locations.

## CONCLUSION

This evaluation compared maternal KAP, incidence of ARI and diarrhea, the prevalence of underweight and stunting, and explored the relationships between maternal KAP and these child health outcomes among urban and rural settings and four types of preschools in south India. The data support the literature that maternal KAP impacts child health in terms of disease and nutrition. It also supports the fact that maternal education is an important factor in child health. Convent school (Type Three) children are the healthiest group in this study, with the best child health scores, the lowest incidence of ARI and diarrhea, and lowest prevalence of underweight and stunting. Children not attending any preschool (Type Four) had the worst outcomes in three of these five categories; these children had the worst child health scores, the highest incidence of diarrhea, and greatest prevalence of stunting. Based on the results of this study, mothers of children attending serviced anganwadis (Type One) preschools are a good target for an intervention since their attitudes toward child health are the highest, but their practices are the worst. These mothers are likely more open to an intervention and are familiar with the organization already providing services in this area. This is helpful information for the community health providers who already monitor children of these women on a regular basis. This evaluation informs and guides the efforts of an organization providing services to children attending anganwadis in south India.

**Figure 1: Concept map: Proposed relationships among study variables**

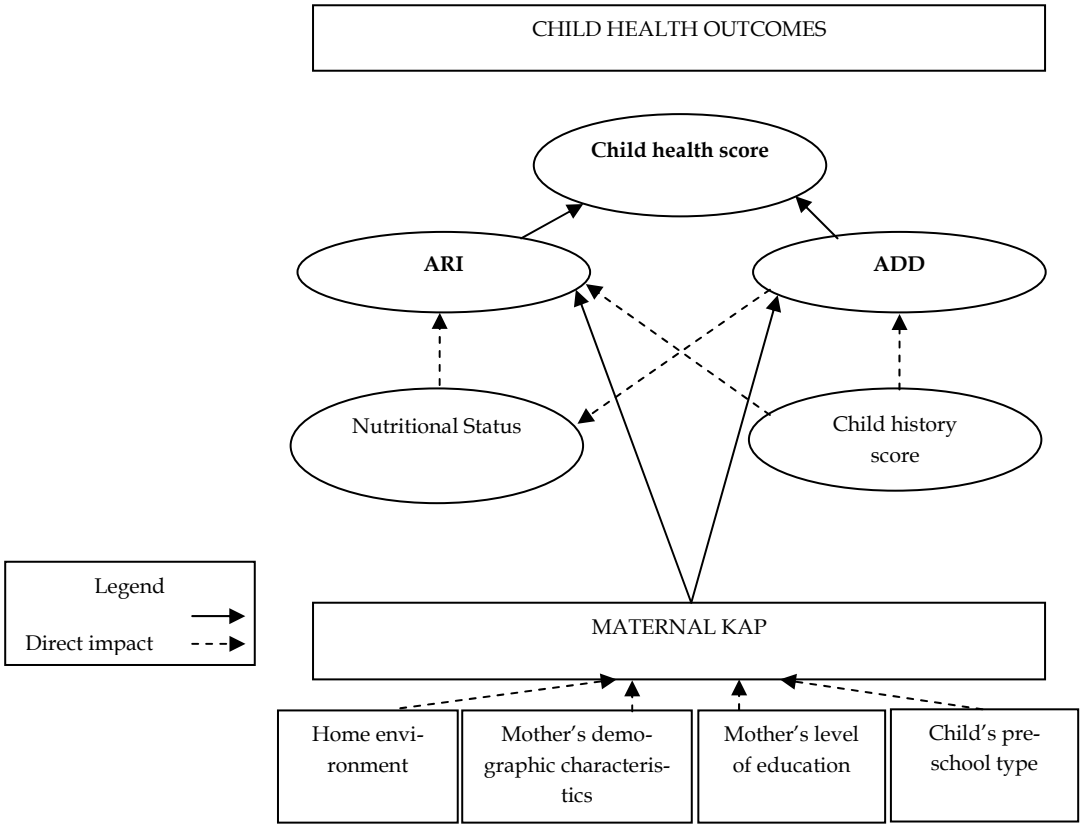


**Figure 1:** ADD=Acute diarrheal disease, ARI=Acute respiratory infections, KAP=knowledge, attitudes, practices The proposed causal pathway and relationships among study variables. Maternal KAP are influenced by living conditions score (comprised of environmental conditions and socio-economic status (SES)), demographic characteristics, education level of the mother, and preschool scenario of the child. Maternal KAP are determining factors in child health outcomes: nutritional status, child history score (breastfeeding and immunization history), ARI, and diarrhea. Nutritional status and history also influence ARI and diarrhea episodes. Child health scores in this study are calculated based on the two-week health recall of ARI and diarrhea.

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