Influence of Non-Maternal Caregivers on Morbidity Profile, Dietary Intake and Development of Preschool Children

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Abstract - The rapid increase in women's participation in the economic activity has led to an increase in reliance on alternative child care for young children, including both child care centres and at-home care. The present study was undertaken to determine the influence of non-maternal caregivers on morbidity profile; dietary intake; and cognitive, motor and language development of preschoolers looked after by caregivers at day care centres and nannies at home. Eighty preschool children between 2 - 6 years of age; 40 looked after by caregivers at day care centres (DCC) and 40 by nannies at home (NH) constituted the study sample. The findings revealed that mothers of NH subjects spent longer time at work place; thus, nannies at home also spent more time per day with the subjects. The DCC subjects experienced more frequent episodes of cold, cough and fever. No significant differences were observed in the intake of different nutrients among subjects in the two groups. Cognitive, motor and language development were better in NH group. At-home care emerged as a better non-maternal care setting for preschoolers; and nannies seemed to provide more positive influence on the health status, dietary habits, and development of subjects as compared to caregivers at day care centres.

Index Terms - Caregivers, Nannies, Day care centres, Morbidity, Dietary intake, Development

I. INTRODUCTION

Preschool age is particularly important as vital development occurs in all domains such as physical, mental, emotional and social, during these years of life. The health, nutrition, education and development opportunities given to a preschool child are extremely important as they determine his or her health and wellbeing for the entire lifetime. Young children are dependent on the care they receive from others and their optimum development is dependent to a large extent on the quality of care they receive, which is further determined by the motivation, skill, physical capacity, consistency, and responsiveness of the caregiver.

Today, more mothers with young children are in paid work than before (1). As the employment rates for mothers of young children have risen over the past few decades, so has the use of formal care in day care centres to informal care by nannies (2). Day care centres typically provide care for children all day, while their parents are at work (3). Informal care is defined as "any private arrangement provided in a family environment, whereby the child is looked after on an ongoing or indefinite basis by relatives or friends or by others in their individual capacity, at the initiative of the child, his/her parents (4). Within the home setting, childcare may be done by employing a 'Nanny', 'Maid' or '*Ayah*' who will look after the child.

Large-scale studies of day care centres (5) reveal that the factors important for a good quality care are group size, caregiver-child ratio, caregiver's educational preparation, and caregiver's personal commitment to learning about and caring for children (6-8). Formal childcare and preschool participation generally is positively associated with cognitive development of children (1). Research on home-based childcare environments suggests that at-home care home is relatively safe and at-home caregivers are affectionate and responsive. However, these studies also suggest that little time is spent on learning activities, such as reading or high-level talk and engagement with children (9-11).

Mothers' employment status has potential implications for virtually all aspects of children's growth and development, and nutrition outcomes are no exception. Preschool age children have high nutrient needs, because they are more physically active and therefore, it is important that caregivers at day care centres and at home should have adequate knowledge of nutrition so that they can help to improve the growth and well-being of children (12). It has been reported that children whose mothers work full-time have less positive nutrition outcomes than children of non-working mothers (13). Additionally, childhood illness rises with day care attendance. There is consistent evidence that spending time in child care centres or other facilities and being exposed to a large number of children for some time provides an opportunity for infectious diseases to be spread (14).

The role of parents and caregivers during these early years is very important as the children spend a lot of time with them and imbibe habits from them. As more and more mothers who were traditionally the primary caregivers of children in their early years are taking up gainful employment, which is keeping them away from their young children for long hours in a day, the role of alternative caregivers has gained importance. It is essential to consider how alternative care provided to young children at home or other institutions such as day care centres affects their nutritional status, health and development (15). With this perspective in consideration, the present study was planned to assess and compare the influence of non-maternal caregivers, that is, caregivers at day care centres and nannies at home on the morbidity profile, dietary intake, and cognitive, motor and language development of

preschool children of employed mothers.

II. MATERIALS AND METHODS

Locale: The present study was conducted on preschoolers (2 - 6 years) belonging to middle and upper middle income group families residing in southern part of Indian National Capital Region.

Sampling: Purposive sampling technique was used to identify and select the subjects, i.e. 80 preschool children (2 – 6 years) of employed mothers – 40 each being looked after by caregivers at day care centres and nannies at home. The mothers of the preschoolers worked for at least eight hours outside their homes. Permission to conduct the study was taken from the day care centres and informed consent was also taken from the mothers of the preschoolers to participate in the study. Anonymity of the subjects and the respondents has been preserved throughout the study.

Development of Tools and Techniques: Keeping in view the objectives of the investigation, a well-structured questionnaire-cum-interview schedule was prepared with methodological procedure and pretested. Based on the responses obtained, modifications were made to make the questionnaire more functional. It was then used to elicit information about the preschoolers from their mothers/ caregivers. It included questions regarding their child's general profile and family characteristics, morbidity profile, activity patterns and dietary practices.

The information regarding dietary intake of the preschoolers was gathered using 24-hour dietary recall for one day. The caregivers provided the information about the meals that the child had in the absence of the mother. Based on the responses gathered from 24-hour dietary recall, food group and dietary intake of the subjects were determined and compared with the recommended intakes/ allowances given by Indian Council of Medical Research (16,17). Nutrient Adequacy Ratio (NAR) was also calculated for energy and other nutrients such as protein, calcium, iron, zinc, vitamin A, vitamin C and B-complex vitamins. NAR was calculated as the actual intake of nutrient by the subjects divided by the subject's RDA for that particular nutrient. Nutrient Adequacy Ratio of >0.66 for a particular nutrient reflected the dietary adequacy (in respect of that nutrient) since that intake met at least two third of the RDA.

The Jamaica Portage Guide to Early Education (18) was used to gather information about cognitive, motor and language development of the preschool subjects. It gave a check list of behaviors in which one could record individual child's progress and level of skill. The list consisted of a complete break down of normal development skills from birth to six years. In the present study, 5 skills were chosen in the cognitive, motor and language areas each and the children's ability to perform those skills was assessed at each age and their total scores in these areas were computed.

Data Analysis: Data coding, entry and validation were done using appropriate software. The data were then subjected to quantitative and qualitative analysis. The frequency and percentages were calculated and Chi square test was applied to determine significant difference between the two groups of preschoolers. Mean and standard deviations were calculated for food and nutrient intakes. Student's 't' test was employed to assess the significant differences in comparison with the standard reference values. STATA (Version 12.0) was used for statistical analysis of the data.

III. RESULTS AND DISCUSSION

The preschoolers looked after by caregivers at day care centres have been referred to as **DCC** subjects and preschoolers looked after by nannies at home as **NH** subjects in the following text.

General Profile and Family Characteristics: There were an equal number of male and female subjects in the study sample. A higher number of subjects in both DCC and NH categories were between 4-6 years of age indicating that with increasing age of children, there was a greater use of alternative childcare settings. All subjects belonged to nuclear families, as this was one of the inclusion criteria decided in the study to eliminate the influence of any other family caregiver on the subjects. Majority of the subjects (78%) in the DCC group were the only child of their parents and 55% of subjects in the NH group had one sibling. It appeared that parents who employed nannies at home to look after their children probably did not mind having another baby, as it did not add to the cost of childcare as against sending two children to day care centres.

Parents' Profile: In both DCC group and NH group, greater percentage of parents were between 31-35 years of age. Nearly 50% of both fathers and mothers in the total sample were postgraduates. The maximum percentages of mothers (61%) as well as fathers (43%) had jobs in the private sector. The private sector jobs have longer working hours, thus, there was a greater reliance on alternative childcare. A higher number of mothers of NH group (50%) as compared to 35% of DCC group spent more time at work place and this seemed to be one of the reasons for mothers of NH group employing nannies to look after their children at home so as to avoid any time restrictions that the day care centres normally imposed. It was found that majority of the mothers in the sample (92%) spent only about 5-6 hours of the daytime with their children.

Activity Pattern: Nearly 80% of the mothers reported that their children were very active. A higher percentage of children from DCC group (85%) preferred both indoor and outdoor games as against 77% of those belonging to NH group. The frequency of performing almost all the outdoor and indoor activities on a daily basis was also higher among DCC group as compared to the NH group. This difference could be because of better infrastructural facilities and fixed schedule for playing at day care centres.

Morbidity Profile: More than 75% of the mothers perceived the health status of their children to be good, followed by 21%

mothers who perceived it as excellent. The subjects of both the groups were compared on the basis of occurrence of ailments like diarrhoea, cold and cough and fever. There was no substantial difference between the two groups in case of diarrhea. Cold and cough was reported in 64% of the total subjects. It was experienced by a higher number of subjects in the DCC group (75%) as compared to the NH group (53%) though this difference was not statistically significant. A statistically significant difference was observed in the number of subjects in the two groups who suffered from fever, with 25% belonging to DCC group and 10% to NH group. It has been reported that spending time in child care centres and being exposed to a large number of children for some time can result in spread of infectious diseases (14). Further, mothers of nearly 80% subjects from the two groups reported their satisfaction regarding care provided to their sick child by alternative caregiver.

Table 1: Distribution of subjects according to the common ailments experienced by them

Common Ailments experienced by subjects	Number of DCC subjects	Number of NH subjects
Diarrhea/ Dysentery	6 (15)	7 (18)
Cold and cough	30 (75)	21 (53)
Fever*	10 (25)	4 (10)

Figures in parentheses denote percentages; χ^2=6.42, *Significant at p≤0.05

Dietary Practices: Early childhood is a critical period for shaping and influencing feeding and lifestyle behaviors that have implications for future health (19). Data revealed that majority of the subjects from both DCC and NH groups had a 5-meal pattern. There was no significant difference in terms of missing meals between both the groups. However, a significant difference was observed between the two groups in the consumption of junk foods, with 67% subjects from NH group showing a fondness for junk foods as against 30% subjects from DCC group. This could be attributed to time constraints for mothers of NH group as they were spending more time at work place; and probably the nannies could not help the children choose the right foods, and allowed higher consumption of junk foods just to pacify the children. The mothers of the subjects were asked to report the information their children received about health, hygiene and nutrition from their alternative caregivers. Data revealed that a greater number of subjects in DCC group (62%) received information on these topics from their caregivers as compared to 52% subjects in NH group. It was further found that aids such as pictures, stories, poems and films were used more by caregivers at day care centres and general conversation was used more by nannies at home to give this important information. This difference could be due to the availability of educational material at day care centres whereas at home the child is under the supervision of a nanny who herself may not be educated or trained enough to impart much knowledge to children. Mothers of mostly all the subjects reported that their caregivers had a positive influence on their children's eating and dietary habits.

Dietary Intake: From the dietary intake data gathered using one day 24 hour diet recall method, mean food and nutrient intake were computed for the subjects belonging to DCC and NH groups.

Food Group Intake – Among the 2-3 year old DCC and NH subjects, cereal consumption was found to be significantly higher than the recommended intakes while the intake of non-vegetarian foods, green leafy vegetables and other vegetables was significantly lower. Milk and milk products were consumed in smaller amounts than recommended by DCC subjects while consumption of roots and tubers and fats and oils was lower in comparison with ICMR recommended intakes among NH subjects. Intake of pulses, fruits and sugar was found to be comparable to the recommended intakes for 2-3 year old subjects (Table 2).

Table 2: Mean daily intake (g/ml) of different food groups in comparison with the recommended intake for 2-3 year and 4-6 year old subjects

FOOD GROUPS	Recommended intake∞ (g/ml)	2-3 year old		Recommended intake∞ (g/ml)	4-6 year old	
		DCC (n=19) Mean±SD (g)	NH (n=16) Mean±SD (g)		DCC (n=21) Mean±SD (g)	NH (n=24) Mean±SD (g)
Cereals and millets	60	123.0***±50.3 (99-147)	106.8***±48.1 (81-132)	120	132.0±36.5 (115-149)	142.9*±46.5 (123-163)
Pulses	30	27.1±26.2 (15-40)	26.6±18.5 (17-37)	30	36.6±16.4 (29-44)	43.1**±20.0 (35-52)
Egg/fish/ meat/ poultry	50	21.4***±25.6 (9-34)	25.6**±31.2 (9-42)	50	22.4***±29.2 (9-36)	29.2**±29.6 (25-95)
Milk and milk products	500	398.4***±108.8 (346-451)	417.2±216.8 (302-533)	500	373.1***±124.1 (316-430)	331.8***±171.2 (260-404)
Green leafy	50	8.9***±29.5 (5-23)	7.8***±21.8 (4-19)	50	11.2***±26.8 (-1-23)	10.4***±26.6 (-8-22)

vegetables						
Other vegetables	50	13.9***±26.7 (1-27)	6.2***±14.5 (2-14)	100	25.0***±30.9 (11-39)	17.3***±30.4 (4-30)
Roots and tubers	50	40.8±28.6 (27-55)	27.2***±20.6 (16-38)	100	42.1***±30.8 (28-56)	50.8***±30.9 (38-64)
Fruits	100	121.1±104.6 (71-172)	123.7±70.1 (86-161)	100	107.6±65.0 (78-137)	128.3±96.0 (88-169)
Visible fats and oils	25	23.9±15.4 (16-31)	16.5***±7.5 (12-20)	25	25.3±10.1 (21-30)	22.7±10.9 (18-27)
Sugar	15	16.9±11.6 (11-22)	14.7±9.9 (9-20)	20	15.8*±9.3 (12-20)	14.7*±9.9 (11-19)

Figures in parentheses denote range
*Significant at p≤0.05; **Significant at p≤0.01; ***Significant at p≤0.001
∞Recommended intake as per balanced diet for 1-3 year and 4-6 year old children by ICMR (17)

Among 4-6 year old subjects (Table 2), cereal and pulse consumption was found to be significantly higher than recommended among NH subjects. The intake of non-vegetarian foods, milk and milk products, all types of vegetables and sugar was significantly lower in both the groups in comparison with the recommended intakes. Consumption of only fruits and visible fats and oils was in accordance with the intake recommended by ICMR (17).

Further, a significant difference was observed in the consumption of milk and milk products, with intake of 2-3 year old NH subjects being higher than their DCC counterparts while the intakes of other vegetables and visible fats and oils were significantly higher among 2-3 year old DCC subjects. All other foods consumed by both 2-3 year and 4-6 year old subjects in the NH and DCC groups were in similar amounts.

Nutrient Intake – No significant differences were observed between 2-3 year and 4-6 year old subjects from DCC and NH groups in terms of their intakes of energy, protein, total fat, carbohydrate, calcium, iron, zinc, vitamin A, vitamin C and B-complex vitamins (Table 3).

Table 3: Comparison between mean nutrient intakes of subjects in DCC and NH groups

Nutrient	2-3 year old		4-6 year old	
	DCC (n=19) Mean±SD	**NH (n=16) Mean±SD**	**DCC (n=21) Mean±SD**	**NH (n=24) Mean±SD**
Energy (Kcal)	1240±274 (1108-1372)	1131±280 (982-1281)	1322±219 (1222-1421)	1287±277 (1170-1404)
Protein (g)	38.8±9.5 (34.2-43.4)	39.7±10.1 (34.3-45.1)	42.3±8.9 (38.2-46.3)	41.5±10.5 (37.1-46.0)
Total fat (g)	51.3±16.7 (43.3-59.4)	43.6±36.9 (37.0-50.3)	51.8±12.9 (45.9-57.7)	47.0±13.5 (41.2-52.7)
Carbohydrate (g)	159.4±33.4 (143.3-175.5)	174.6±112.1 (114.8-234.3)	177.7±36.6 (161.1-194.3)	175.8-37.9 (159.8-191.8)
Calcium (mg)	684±208 (432-1351)	681±263 (345-902)	648±149 (320-1312)	609±217 (276-1049)
Iron (mg)	8.4±4.5 (6.2-10.6)	7.4±2.3 (6.3-8.9)	9.0±2.0 (7.0-13.0)	9.0±2.0 (5.0-16.0)
Zinc (mg)	2.9±1.5 (2.2-3.6)	2.4±1.1 (1.8-3.0)	3.1±0.9 (2.7-3.6)	3.3±1.4 (2.7-3.9)
Vitamin A (µg)	358±158 (282-434)	381±164 (281-418)	350±150 (294-469)	331±162 (262-399)
Vitamin C (mg)	82±111 (12-447)	48±37 (8-169)	58±53 (8-243)	62±61 (17-294)
Thiamine (mg)	0.8±0.3 (0.5-1.8)	0.8±0.2 (0.5-1.5)	0.9±0.2 (0.5-1.5)	0.9±0.2 (0.4-1.2)
Riboflavin (mg)	1.1±0.3 (0.6-1.9)	1.2±0.4 (0.4-2.2)	1.1±0.3 (0.5-1.7)	1.0±0.4 (0.2-1.9)
Niacin (mg)	4±1 (2-68)	5±2 (3-10)	6±2 (3-9)	6±1 (4-10)
Dietary folate (µg)	108±42 (29-194)	132±44 (71-238)	138±50 (70-264)	133±59 (41-267)
Vitamin B_{12} (µg)	0.9±0.5 (0.2-1.6)	1.2±0.7 (0.3-2.9)	0.9±0.5 (0.3-2.1)	1.0±0.6 (0.3-2.5)

Figures in parentheses denote range

Majority of the subjects in both DCC (95%) and NH (88%) groups had an energy intake of above 70% of the recommended dietary allowances (RDA). The data on NAR (Table 4) indicated that majority of subjects in both groups showed an adequate intake of protein, calcium, vitamin B_{12}, thiamin, riboflavin and dietary folate. Intake of vitamin A was almost equally distributed in both adequate and inadequate categories for both groups. A greater percentage of subjects in DCC group (37%) had an inadequate intake of vitamin C as compared to subjects of NH group (15%). A high percentage of subjects (70%) in both groups had an inadequate intake of zinc. Intake of iron and niacin was fairly adequate in both the groups.

Table 4: Distribution of subjects according to their Nutrient Adequacy Ratio

Nutrient	NUTRIENT ADEQUACY RATIO (NAR)					
	DCC (n=40)			NH (n=40)		
	<0.66	0.66-<1.0	≥1.0	<0.66	0.66-<1.0	≥1.0
Protein (g)	0 (0)	0 (0)	40 (100)	0 (0)	0 (0)	40 (100)
Calcium (mg)	1 (2)	13 (33)	26 (67)	5 (12)	14 (35)	21 (53)
Iron (mg)	5 (12)	18 (45)	17 (43)	6 (15)	16 (40)	18 (45)
Zinc (mg)	28 (70)	10 (25)	2 (5)	28 (70)	10 (25)	2 (5)
Vitamin A (µg)	14 (35)	11 (27)	15 (38)	13 (33)	11 (27)	16 (40)
Vitamin C (mg)	15 (37)	8 (20)	17 (43)	6 (15)	11 (27)	23 (58)
Thiamin (mg)	0 (0)	4 (10)	36 (90)	0 (0)	3 (7)	37 (93)
Riboflavin (mg)	0 (0)	2 (5)	38 (95)	1 (2)	6 (15)	33 (83)
Niacin (mg)	17 (43)	18 (45)	5 (12)	14 (35)	21 (53)	5 (12)
Dietary folate (g)	2 (5)	7 (17)	31 (78)	2 (5)	4 (10)	34 (85)
Vitamin B_{12} (µg)	0 (0)	0 (0)	40 (100)	0 (0)	0 (0)	40 (100)

Figures in parentheses denote percentage; $\chi 2$: Not significant

Cognitive, Motor and Language Development: Five skills from the Jamaica Portage Guide were chosen in the cognitive, motor and language areas each and the children's ability to perform those skills was assessed on a scale of 0-5. It was found that the mean cognitive development, motor and language development scores at each age were higher in NH group as compared to DCC group, however, a significant difference was seen in case of only motor and language development (Table 5). The higher scores for cognitive, motor and language development in NH subjects could be attributed to more personalized attention, familiar environment at home and enhanced stimulation.

Table 5: Mean cognitive, motor and language development scores of subjects of two groups

Domain of development	DCC (n=40) Mean±SD	NH (n=40) Mean±SD	't' Value
Cognitive development	1.62±0.49 (1.46 – 1.78)	1.77±0.42 (1.63 – 1.91)	1.46 (NS)
Motor development	3.90±0.81 (3.64 – 4.15)	4.32±0.76 (4.08 – 4.56)	-2.41*
Language development	2.70±0.64 (2.49 – 2.90)	3.25±1.05 (2.91 – 3.58)	-2.80**

Values in parentheses denote range; *Significant at p≤0.05; **Significant at p≤0.01; NS: Not Significant

IV. CONCLUSION

Research increasingly supports the important link between childcare environment and development. A stimulating care setting is essential for good nutritional and health status of children to achieve their full potential, mental growth and well being. From the findings of the present study, it could be concluded that at-home care by well-trained and guided nannies seemed to be a better

setting for optimum health status, dietary intake and development of preschool children of gainfully employed mothers as compared to care provided at day care centres. Home based care also showed potential benefits for parents as it supported them in fulfilling their family and work responsibilities by offering flexible timings. The preschoolers looked after by nannies at home emerged as a significantly better group in terms of motor and language development in the present study. The occurrence of cold and cough and fever episodes were also fewer among this group. Between the preschoolers looked after at day care centres and at home, no substantial differences or distinct patterns were observed in terms of food or nutrient intakes. The present study was only a preliminary research to assess the influence of non-maternal caregivers on preschoolers' morbidity and developmental patterns and food behavior. Further research needs to be done to understand how each and every characteristic of non-maternal caregivers can influence the diet and development of young children.

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