

# Utilisation of Supplementary Nutritional Services of ICDS by Paediatric Beneficiaries of Central Kerala, India: A Cross-sectional Study

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## ABSTRACT

**Introduction:** Integrated Child Development Scheme (ICDS) is a unique programme for childhood care and development. ICDS had expanded progressively over the past four decades, also the budget allotment for the programme has been increasing over the years. However, the expansion in coverage has not been translated into a proportionate increase in utilisation.

**Aim:** To evaluate the utilisation of supplementary nutritional services of ICDS and also to assess the reasons for not utilising the same by paediatric beneficiaries.

**Materials and Methods:** This community based cross-sectional study was conducted in the Department of Community Medicine, Government Medical College (selected Rural Community Health Centre), Thrissur district, Kerala, India, during January 2019 to August 2019. A total of 290 children, aged between six months to six years, were permanent residents were selected to participate in the study. Data were collected using pre-tested structured proforma by interviewing all the study subjects. Univariate analysis and logistic regression were used for statistical analysis to find the factors affecting the non utilisation of ICDS services.

**Results:** Among the 290 participants, 141 (48.6%) were in the age group of six months to three years while 149 (51.4%) were in the age group 3-6 years, and 154 (53.1%) were boys and 136 (46.9%) were girls. The regular utilisation of supplementary nutrition was 67 (47.5%, 95% CI- 39.1, 56.1) in the age group six months to three years and 83 (55.7%) in 3-6 years. The main reasons for non utilisation were that children attended playschool and a lack of perceived benefits. Those who lived near Anganwadi Centres (AWC) had significantly higher utilisation. Utilisation among children between 3-6 years of age was significantly lower in those with higher maternal education ( $p$ -value<0.001), and who reach Anganwadi by vehicle ( $p$ -value<0.001).

**Conclusion:** The study found that regular utilisation of supplementary nutrition was poor. Those who were staying away from Anganwadi and who had higher maternal education had lower utilisation of ICDS nutritional services. Public-private partnerships in providing hot cooked meals from Anganwadi in playschools can be explored to increase utilisation.

**Keywords:** Amrutham powder, Anganwadi, Integrated child development scheme, Nutrition

## INTRODUCTION

The early years of childhood are the most vulnerable period. This period has the greatest risks of survival, healthy growth, and vulnerability to the vicious cycle of malnutrition and infections [1,2]. ICDS is the world's most unique and largest programme for early childhood development. The programme has expanded progressively over the past four decades [3-5]. Budget allotment for the programme has been increasing over the years. The allocation for Anganwadi Services increased by 7% from 15,245 crores in the financial year 2017-18 to 16,335 crores in the financial year 2018-19 [6]. It is doubtful whether the expansion in coverage and budget had translated into a proportionate increase in utilisation.

Even though the primary objective of the supplementary nutritional programme under ICDS is to reduce the nutrition gap among children between 0-6 years, the proportion of ICDS beneficiaries who are malnourished had been increasing [6,7]. In March 2015, 15% of ICDS beneficiaries were malnourished, this increased to 22% by March 2016 and 25% as of September 2017. During this same time period, the percentage of children who were wasted increased by 1% and those who were severely wasted increased by 2% [7].

Even though Kerala has better health indicators compared to other parts of the country, the proportion of children who are wasted has remained at the same level (16%) in both National Family Health Survey-3 (NFHS-3) and NFHS-4 [8,9]. It is high time, that some rethinking is done in this regard. Thus, the present study was undertaken to assess the utilisation of supplementary nutritional

services of ICDS and to study the reasons for not utilising the same by paediatric beneficiaries.

## MATERIALS AND METHODS

A community based cross-sectional study was conducted in the Department of Community Medicine, Government Medical College (selected Rural Community Health Centre), Thrissur district, Kerala, India, from January 2019 to August 2019. Institutional Ethical Committee approval (IEC: B6-8772/2016/MCTCR dated 17/11/2017) was obtained prior to the conduct of the study. After informing about the purpose of the study, written informed consent was obtained from all informants (preferably by the study participant's mother).

**Inclusion criteria:** Children aged between six months to six years, who were permanent residents of the selected area, atleast for the past one year and whose informant (mother) gave consent to participate in the study were included in the study.

**Exclusion criteria:** Households found locked at the time of the visit and children, whose informants were not willing to participate in the study were excluded in the study.

**Sample size calculation:** Sample size was calculated with an absolute precision of 8.5, type 1 error of 5%, design effect of 2, and non response rate of 5% [10] by using the formula:

$N=4 pq/d^2$ , where  $p$ =prevalence,  $q=100-p$ ,  $d$ =allowable error. The sample size was calculated to be 290.

A cluster sampling technique with probability proportionate to size was used as the sampling technique. Wards were taken as

clusters and the sampling unit was children six months to six years of age. The numbers of wards were taken as five (total clusters- 13) and 58 participants from each cluster were included in the study [Annexure-1]. From the list available from Accredited Social Health Activist (ASHA) workers, the required number of participants was selected from each of the selected wards by simple random sampling using a simple random number table. All the study participants were selected from the same sampling frame.

## Study Procedure

**Questionnaire:** The semi-structured questionnaire was developed by the researchers, based on the study objectives after reviewing the literature [11-13]. A pilot study was conducted among 70 participants (mothers having young children) to validate the tool. The reliability of the questionnaire was tested by Cronbach's alpha ( $\alpha=0.863$ ) and was found reliable. Two questions which were irrelevant were removed and the final Cronbach's alpha was 0.919. The questionnaire contained 15 questions which included both closed ended and open ended questions [Annexure-2]. The informants were interviewed at their residences using this pretested questionnaire to collect information regarding socio-demographic details and utilisation of ICDS services. Socio-demographic data such as the educational status of parents, employment status of parents, family income, type of family, and socio-economic status was obtained. Since the study area was a peri-urban region, socio-economic status was assessed using modified Kuppaswamy classification (updated for the year 2019) [14].

**Operational definition:** Regular utilisation of supplementary nutrition given for children in the age group six months to three years was defined as consuming Amrutham powder (take-home ration) for 5-7 days a week for the past one year. Regular utilisation of supplementary nutrition for children 3-6 years was defined as taking hot cooked meals in AWC for 5-7 days a week for the past one year. Irregular utilisation of supplementary nutrition was defined as consuming hot cooked meals or Amrutham powder for  $\leq 4$  days a week for the past one year [15,16]. Since the supplementary nutrition services from AWC of 6-35 months and 3-6 years were different, they were analysed separately.

## STATISTICAL ANALYSIS

The data was entered in Microsoft (MS) Excel and analysed using Statistical Package for the Social Sciences (SPSS) software version 20.0 (IBM Corp., Armonk, New York, USA). Utilisation of supplementary nutritional services was expressed as proportions with a 95% confidence interval. Categorical variables were analysed using Chi-square test. The dependent variable was regular utilisation of supplementary nutrition from AWCs. The significant factors in the bivariate analysis ( $p$ -value $<0.05$ ) were used to perform multivariable logistic regression to obtain an adjusted odds ratio for these factors. The level of significance was estimated with  $p$ -value of  $\leq 0.05$ .

## RESULTS

Among the 290 children, 141 (48.6%) were in the age group between six months to three years and the rest 149 (51.4%) were between 3-6 years. A total of 154 (53.1%) were boys and 136 (46.9%) were girls. More than half of the study population were Hindus, 155 (53.6%) followed by 129 (44.5%) Christians. Majority of the mothers had received an education of a higher secondary level or above and were housewives. Among those who were employed, 21 (7.3%) of them were professional/semi-professional, and 12 (4.1%) were having other jobs. Among the study participants, 193 (66.6%) belonged to upper lower, 85 (29.3%) lower-middle and 12 (4.1%) upper-middle socio-economic status [Table/Fig-1]. In the present study, among the 290 children, only 225 (77.2%) study participants had received supplementary nutrition provided by the AWC during the previous year.

Variables	Classification	Number of participants (n=290)	Percentage (%)
Gender	Male	154	53.1
	Female	136	46.9
Age group	6 months to 3 years	141	48.6
	3-6 years	149	51.4
Religion	Hindu	155	53.6
	Christian	129	44.5
	Muslim	6	2.1
Mother's education	Up to High school or post high school diploma	49	16.6
	Graduate and above	241	83.4
Father's education	Up to High school or post high school diploma	226	77.9
	Graduate and above	64	22.1
Father's occupation	Professional/ semi-professional	44	15.2
	Other working jobs	245	84.4
	Not working	1	0.3
Work status of mother	Professional/ semi-professional	21	7.3
	Other working jobs	12	4.1
	Not working	257	88.6
House visit by ICDS worker	Yes	231	79.9
	No	59	20.1
Reach AWC	Walking	197	67.9
	By vehicle	93	32.1
Socio-economic status	Upper lower	193	66.6
	Lower middle	85	29.3
	Upper middle	12	4.1

[Table/Fig-1]: Socio-demographic characteristics of study participants.

Out of 149 children in the age group 3-6 years, utilisation of supplementary nutrition was done by 102 (68.5%). But only 83 (55.7%) of them had regularly received supplementary nutrition from AWCs. Among those who had received supplementary nutrition, 1 (0.8%) perceived that quantity was not sufficient, 9 (8.8%) informed quality of nutrition was not acceptable and 9 (8.8%) had digestive problems due to intake of supplementary nutrition from AWCs [Table/Fig-2].

Among the 47 study participants who had not used supplementary nutrition services from AWC, 22 (46.8%) participants attended

Supplementary nutrition	Category	Number (n=149)	Percentage (%)
Ever received supplementary nutrition received in the last year	Yes	102	68.5
	No	47	31.5
Frequency of receiving supplementary nutrition	5-7 days/week (regular utilisation)	83	55.7
	2-4 days/week	1	0.7
	once in a week to once in a year	18	12.1
	Not even in last one year	14	9.4
	Never received it	33	22.1
Digestive problems due to intake of supplementary nutrition (n=102)	Yes	9	8.8
	No	93	91.2
Quantity of supplementary nutrition (n=102)*	Adequate	91	89.2
	Not adequate	11	10.8
Quality of supplementary nutrition (n=102)*	Acceptable	93	91.2
	Not acceptable	9	8.8

[Table/Fig-2]: Utilising supplementary nutrition services among 3-6 years from AWC. \*As perceived by the mother of study participants

playschool/other institutions, 10 (21.3%) had not perceived any benefits, 4 (8.5%) were not aware, 4 (8.5%) were not satisfied with the preparation of supplementary nutrition, 3 (6.3%) parents had no time for availing the services, 2 (4.3%) of child's father was not allowing the child to attend AWC and 2 (4.3%) informed that Anganwadi building was poorly constructed [Table/Fig-3].

Reasons for not utilising supplementary nutrition among children between 3-6 years for past one year	Number (n=47)	Percentage (%)
Joined playschool/LKG/UKG	22	46.8
Lack of perceived benefit of supplementary nutrition from AWCs	10	21.3
Not aware of supplementary nutrition from AWCs	4	8.5
Not satisfied with the preparation of supplementary nutrition	4	8.5
No time for parents	3	6.3
Child's father is not allowing child to attend AWC	2	4.3
Anganwadi building is poorly constructed	2	4.3

**[Table/Fig-3]:** Distribution of study participants between 3-6 years, based on reasons for not utilising supplementary nutrition services from AWC for past one year.

Consumption of supplementary nutrition was significantly less among children of mothers with professional/semi-professional jobs (p-value=0.037), having higher than high school education (p-value<0.001), who lived far from AWCs (p-value<0.001), houses not visited by ICDS workers (p-value=0.018) and among the Christian region (p-value=0.045) [Table/Fig-4].

Variables	Classification	Utilisation of supplementary nutrition		p-value
		Regular n (%)	Irregular n (%)	
Gender	Male	31 (48.4)	33 (51.6)	0.12
	Female	52 (61.2)	33 (38.8)	
Age group (months)	36-47	48 (64)	27 (36)	0.06
	48-59	26 (52)	24 (48)	
	60-72	9 (37.5)	15 (62.5)	
Religion	Hindu	48 (62.3)	29 (37.7)	<b>0.045</b>
	Muslim	3 (100)	0 (0)	
	Christian	32 (46.4)	37 (53.6)	
Mother's education	Up to high school and post high school diploma	52 (72.2)	20 (27.8)	<b>&lt;0.001</b>
	Graduate and above	31 (40.3)	46 (59.7)	
Work status of mother	Professional/semi-professional	4 (30.4)	9 (69.2)	<b>0.037</b>
	Other working jobs	7 (87.5)	1 (12.5)	
	Not working	72 (56.3)	56 (43.8)	
House visit by ICDS worker	Yes	80 (58.8)	56 (41.2)	<b>0.018</b>
	No	3 (23.1)	10 (76.9)	
Reach AWC	Walking	78 (66.1)	40 (33.9)	<b>&lt;0.001</b>
	By vehicle	5 (16.1)	26 (83.9)	
Socio-economic status	Upper lower	2 (50)	2 (50)	0.944
	Lower middle	23 (57.5)	17 (42.5)	
	Upper middle	58 (55.2)	47 (44.8)	

**[Table/Fig-4]:** Association between selected factors and regular utilisation of supplementary nutrition among child beneficiaries between 3-6 years (n=149). p-value in bold font indicates statistically significant values

The multivariable logistic regression model was statistically significant (Chi-square test=39.96, p-value <0.001) with an R<sup>2</sup> value of 0.32 and an overall prediction of 92.8%. Those children who reach AWCs by walking (adjusted odds ratio: 7.3, 95% CI 2.3 to 24.2) were found to have significantly higher utilisation of supplementary nutrition than those who had to take a vehicle to reach AWCs. Children of mothers who had graduate and above degree (adjusted odds

ratio: 0.39, 95% CI 0.18 to 0.85) had significantly lesser utilisation of supplementary nutrition than those who had mothers who were not graduates [Table/Fig-5].

Independent variable	Classification	OR* (95% CI)	Adjusted OR (95% CI)	p-value
Religion	Hindu	2.03 (1.05, 3.92)	1.3 (0.6, 2.8)	0.44
	Muslim/Christian	Reference		
Education status of mother	Up to high school and post high school diploma	Reference	0.39 (0.18, 0.85)	<b>0.017</b>
	Graduate and above	0.28 (0.14, 0.55)		
Work status of mother	Professional/ semi-professional	Reference	13.5 (0.9,192)	0.055
	Other working jobs	15.7 (1.4, 174.3)		
	Not working	2.89 (0.9, 9.9)		
Visit by ICDS worker	Yes	4.76 (1.25,18.09)	2.7 (0.46,15.3)	0.27
	No	Reference		
Reach AWC	Walking	10.1 (3.6, 28.4)	7.3 (2.3, 24.2)	<b>&lt;0.001</b>
	By vehicle	Reference		

**[Table/Fig-5]:** Multivariable logistic regression between selected factors and regular utilisation of supplementary nutrition among child beneficiaries between 3-6 years (n=149).

The utilisation of supplementary nutrition (Amrutham powder) among the 141 study participants between 6 to 35 months was 109 (77.3%) and 67 (47.5%) of them had regularly taken supplementary nutrition [Table/Fig-6].

Supplementary nutrition	Number (n=141)	Percentage (%)
Ever received Amrutham powder in the past one year	109	77.3
Frequency of consuming Amrutham powder		
5-7 days/week (regular intake of Amrutham powder)	67	47.5
2-4 days/week	10	7.1
Once in 1-2 weeks	8	5.7
Once in 2 weeks to 12 month	24	17
Never	32	22.7
History of ADD after consuming Amrutham powder <sup>#</sup>	6	5.6
Shared Amrutham powder with family members <sup>#</sup>	47	51.4

**[Table/Fig-6]:** Utilising supplementary nutrition services among 6-35 months aged children.

<sup>#</sup>among 109 participants who had received Amrutham powder from AWC  
ADD: Acute diarrhoeal diseases

Regular utilisation of Amrutham powder among child beneficiaries was significantly lower among Christians/Muslims when compared to Hindus (p-value=0.007). Consumption of Amrutham powder was not statistically associated with age, sex, socio-economic status, education of the mothers. Visit of AWC in beneficiary's house also had no association with regular utilisation of take home ration [Table/Fig-7].

Among the 32 study participants who had not used Amrutham powder from AWC, 15 (46.9%) said that it was not available from AWCs, 11 (34.4%) had not perceived the benefit of it, 3 (9.4%) were not aware, 2 (6.2%) informed that it was unhygienically prepared and 1 (3.1%) informed that there is no regular supply of Amrutham powder in AWCs [Table/Fig-8].

## DISCUSSION

A cross-sectional study was conducted in a rural area of Thrissur district, Kerala, India, to study the utilisation of ICDS services among 290 children under six years of age. In the present study, 14.2% of the mothers of study participants were employed. The occupational status of the participant's

Variables	Classification	Utilisation of supplementary nutrition		Chi-square, p-value
		Regular n (%)	Irregular n (%)	
Gender	Male	45 (50)	45 (50)	0.433, 0.485
	Female	22 (43.1)	29 (56.9)	
Age group (months)	6-11	9 (36)	16 (64)	3.5, 0.173
	12-23	42 (54.5)	35 (45.5)	
	24-35	16 (41)	23 (59)	
Religion*	Hindu	45 (55.6)	33 (44.4)	7.2, 0.007
	Muslim	0 (0)	3 (100)	
	Christian	22 (36.7)	38 (63.3)	
Mother's education	Up to high school and post high school diploma	22 (44)	28 (56)	0.38, 0.53
	Graduate and above	45 (49.5)	46 (50.5)	
Socio-economic status	Upper lower	40 (45.5)	48 (54.5)	0.904, 0.636
	Lower middle	22 (48.9)	23 (51.1)	
	Upper middle	5 (62.5)	3 (37.5)	
House visit by ICDS worker	Yes	48 (50.5)	47 (49.5)	1.4, 0.244
	No	18 (40)	27 (60)	
Work status of mother	Working	6 (50)	6 (50)	0.032, 1.000
	Not working	61 (47.3)	68 (52.7)	

**[Table/Fig-7]:** Association between selected factors and regular utilisation of supplementary nutrition among child beneficiaries between 6-35 months.

\*Since number of Muslims was very less, Muslim and Christian were taken as one group for calculating  $\chi^2$  test for religion.

Reasons for not utilising Amrutham powder	Number (n=32)	Percentage (%)
Not available in AWCs	15	46.9
Didn't perceive any benefit of in having Amrutham powder	11	34.4
Not aware of Amrutham powder	3	9.4
Unhygienic preparation of Amrutham powder	2	6.2
No regular supply of Amrutham powder in AWCs	1	3.1

**[Table/Fig-8]:** Distribution based on reasons for not utilising Amrutham powder from AWC in study participants less than three years for past one year

mothers was found to be lower than that of NFHS-4 India data, in which 24% of women aged 15-49 years were employed [17]. This may be probably due to the study being conducted in a rural area where the proportion of women who are employed was low.

The utilisation of supplementary nutrition in this study among the age group between 3-6 years was 68.5%. Utilisation was found to be much higher in previous studies, more than 80% of children 3-6 years of age were availing the same [12,18,19]. Previous study conducted in Trivandrum among mothers having under five years of age children found similar results, where 65% were utilising supplementary nutrition [20]. Other major reasons for not utilisation in previous literature is given in [Table/Fig-9] [11-13,18-23].

The lower utilisation of AWCs in the present study among children between 3-6 years may be due to increased admissions in private nurseries. Only 9 (8.8%) participants reported unacceptable quality of supplementary nutrition in this study. The finding were in contrast to the studies conducted in Uttar Pradesh, Karnataka and West Bengal, India, where the main reason was that food was unhygienic, not cooked properly and of bad quality in AWCs [11,12,24]. In the study done among children in Karnataka by Nagaraja GM et al., the reason for dropout from Anganwadi was suffering from various stomach problems following consumption of Anganwadi food [12]. In the present study, 47.5% of the children, less than 35 months had regularly consumed Amrutham powder. The finding was similar to the study in Gujarat, India, by Chaturvedi A et al., where the majority (81.7%) used it, but regular consumption was low (42.2%) [13]. Sharing of Amrutham powder by family members was seen in more than half of the study participants in this study.

In the present study, regular utilisation of supplementary nutrition among child beneficiaries between 3-6 years was significantly higher among mothers who had education up to high school education than among those with education graduate and above. In the study by Rehman HM et al., at Lucknow, similar findings were obtained, the beneficial perception of

Authors name	Place and year of the study	Sample size	Percentage of the children who utilised the service	Major reasons for not utilisation
Khan AA et al., [11]	Bareilly, Uttar Pradesh in 2015	Children between 6 months to 3 years- 1354	61%	Not good for health Did not like the taste
		Children between 3-6 years- 1332	50.6%	Food is unhygienic and bad in quality Did not like the taste
Chaturvedi A et al., [13]	Gujarat in 2018	Children between 6 to 35 months- 1623	81.7%	Did not like the taste Inadequate distribution of packets (take home ration)
Nagaraja GM et al., [12]	Kolar district, Karnataka in 2011-12	Children between 6 months to 6 years- 224	86.61%	Food is not cooked properly, AWC not taking care of child
Rathore MS et al., [18]	Rajasthan, 2013-14	Children between 6 months to 3 years- 509	95.4%	Not mentioned
		Children between 3-6 years- 327	92.4%	
Mittal N and Meenakshi JV [19]	Bihar, Jharkhand and Orissa, 2012	Children between 0-6 years- 304	13.65%	Not mentioned
Nath LR [20]	Trivandrum, Kerala in 2015	Children under 5 years- 322	65%	Not mentioned
Rehman HM et al., [21]	Lucknow, 2015-16	Children between 3-6 years- 314	60.5%	Supplementary food not beneficial No proper guidance AWC not coming to centre regularly AWC not taking care of child
Das R [22]	Agartala, Tripura, 2015	Children Below 6 Years- 115	67.50%	No knowledge of services Send children to private nursery
Surwade JB et al., [23]	Latur district, Maharashtra, 2013	Children between 3-6 years- Urban-252 Rural- 254	Urban area-48.03% Rural area-37.7%	Not mentioned
Present study	Thrissur, Kerala	Children between 6 months- 6 years 290	68.5%	Lack of perceived benefits of ICDS

**[Table/Fig-9]:** Details of the utilisation of the supplementary nutritional services from Anganwadi in previous studies done in different states [11-13,18-23].

supplementary nutrition decreased with an increase in the level of education of the mother and this association was statistically significant [21].

Among study participants who had not used Amrutham powder, less than half of the participants informed that it was not available from AWCs. A similar reason was found in previous studies, where an interruption in the supply of supplementary food was reported in 76.66% of AWC [13,25]. Hence, the monthly distribution of adequate Amrutham packets emerged as a strong predictor of regular consumption of supplementary nutrition.

More than one-third of participants who did not use Amrutham powder in the present study had not perceived the nutritional benefit of the same. In the study done by Khan AA et al., among children between six months to three years, 68.4% of parents believed that supplementary nutrition was not good for health [11]. In a study conducted in a tribal area of Orissa, the poor quality of the food materials supplied to the centres had kept the beneficiaries away from the ICDS activities [26]. But only a few informed of Amrutham powder was unhygienically prepared in this study.

In the present study, consumption of Amrutham powder (take-home ration) was not statistically associated with age, sex, socio-economic status, education, and occupation of the parents. A study conducted by Khan AA et al., among children between six months to three years found that the consumption of supplementary nutrition was not statistically associated with the education and occupation of parents [11]. On the contrary children in the age group, 12-24 months and girls had significantly increased intake of supplementary nutrition than other age groups and boys. A study conducted in North Kerala by Anitha SS et al., found similar findings that factors like sex of the child, type of family, socio-economic status, maternal education, occupation, and birth order were not significantly associated with utilisation of take-home ration [27].

### Limitation(s)

The limitation of the study was assessing reasons for the non utilisation of supplementary ICDS service which could have been done by qualitative approach. It was not done due to a lack of resources and time constraints.

### CONCLUSION(S)

Regular utilisation of supplementary nutrition was poor among children. Those who had higher maternal education and had to travel by vehicle to reach AWCs had lower utilisation of ICDS nutritional services, since they preferred to send their children to playschool or other institutions. Lack of perceived benefits of ICDS services was also a reason for non utilisation of services. Public-private partnerships in providing hot cooked meals from Anganwadi in playschools/private nurseries can be explored to increase utilisation. Focus group discussions and in-depth interviews can be conducted on matters concerning the utilisation of Anganwadi services, problems faced in AWCs, and reasons for non use. Regular social audits can also be done to improve the utilisation of ICDS services.

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S. No.	Ward Number	Number of houses	Number of under six-year-old children	Cumulative population	Selection of clusters	Selected clusters
1	1	393	118			
2	2	414	120	238	200 (random number generated)	1
3	3	376	118	356		
4	4	418	120	476		
5	5	416	120	596	200+310 (sampling interval) =510	2
6	6	389	118	714		
7	7	392	118	832	510+310 =820	3
8	8	408	120	952		
9	9	328	117	1069		
10	10	443	120	1189	820+310 =1130	4
11	11	330	118	1307		
12	12	401	120	1427		
13	13	409	120	1547	1130+310 =1440	5
	Total	5117	1547			

Sampling interval=Cumulative population/5=309.4≈310

Random number generated between 1 and total population is 200

Then the sampling interval was added to obtain next 4 clusters.

So, ward numbers 2, 5, 7, 10 and 13 were selected as study clusters.

**[Annexure-2]****Study questionnaire**

1. Age
  2. Gender
  3. Religion
  4. Educational status of father and mother
  5. Occupation of father and mother
  6. Per capita income of family
  7. Are you aware of the supplementary nutritional services at AWC (yes/no)
  8. Has ICDS worker visited your home in the past one year? (yes/no)
  9. Mostly how do you reach Anganwadi? Walking/Vehicle
  10. Have your child received supplementary nutritional services from AWC in the past one year (yes/no)
    - a) If not, Reason.....
- Questions 11-12 applicable only to children aged between 3-6 years
11. Frequency of obtaining the supplementary nutrition from AWC
    - a) Perceived quantity nutrition from AWCs- not sufficient/ sufficient
    - b) Perceived quality of nutrition from AWCs- acceptable/not acceptable
  - 12) Have you had any digestive problems attributed to it? (yes/no)
- Questions 13-15 applicable only for children between 6 months to 3 years
- 13) Do you use Amrutham powder? (yes/no)
    - a) If yes, frequency of use
    - b) If not, Reasons
  - 14) Is it shared among household members yes/no
  - 15) Has the Amrutham powder caused diarrhoea or vomiting to the child? yes/no