ASSESSMENT OF NUTRITIONAL STATUS OF EARLY ADOLESCENT SCHOOL GIRLS IN DANTIWADA TALUKA OF BANASKANTHA DISTRICT, GUJARAT

BY

VALAND URMILABEN RAMESHBHAI
B.Sc. (Hons.) Home Science and Nutrition

DEPARTMENT OF FOODS SCIENCE AND NUTRITION
ASPEE COLLEGE OF NUTRITION AND COMMUNITY SCIENCE
SARDARKRUSHINAGAR DANTIWADA AGRICULTURAL UNIVERSITY
SARDARKRUSHINAGAR – 385 506 [GUJARAT]

OCTOBER –2022

[Registration No. 04-HOMMA-02349-2020]

ASSESSMENT OF NUTRITIONAL STATUS OF EARLY ADOLESCENT SCHOOL GIRLS IN DANTIWADA TALUKA OF BANASKANTHA DISTRICT, GUJARAT

A THESIS SUBMITTED TO
SARDARKRUSHINAGAR DANTIWADA AGRICULTURAL UNIVERSITY
IN PARTIAL FULFILMENT OF THE REQUIREMENTS
FOR THE AWARD OF THE DEGREE

OF

MASTER OF SCIENCE
(Home Science)

IN

FOODS AND NUTRITION

BY

VALAND URMILABEN RAMESHBHAI
B.Sc. (Hons.) Home Science and Nutrition

DEPARTMENT OF FOODS SCIENCE AND NUTRITION
ASPEE COLLEGE OF NUTRITION AND COMMUNITY SCIENCE
SARDARKRUSHINAGAR DANTIWADA AGRICULTURAL UNIVERSITY
SARDARKRUSHINAGAR – 385 506 [GUJARAT]

OCTOBER –2022

[Registration No. 04-HOMMA-02349-2020]

CERTIFICATE

This is to certify that, I have no objection for supplying to any scientist only one copy or any part of this thesis at a time through reprographic process, if necessary for rendering reference service in a library or documentation center.

Place : Sardarkrushinagar **[VALAND URMILABEN R.]**
Date : October, 2022

SARDARKRUSHINAGAR DANTIWADA AGRICULTURAL UNIVERSITY
ASPEE COLLEGE OF NUTRITION AND COMMUNITY SCIENCE
SARDARKRUSHINAGAR-385 506 (GUJARAT)

CERTIFICATE – I

Date : /10/2022

This is to certify that the thesis entitled, **"ASSESSMENT OF NUTRITIONAL STATUS OF EARLY ADOLESCENT SCHOOL GIRLS IN DANTIWADA TALUKA OF BANASKANTHA DISTRICT, GUJARAT"** submitted for the degree of **MASTER OF SCIENCE (Home Science)** in the subject of **FOODS AND NUTRITION** is a record of bonafide research work carried out by **VALAND URMILABEN RAMESHBHAI** under my guidance and supervision and that no part of this thesis has been submitted for any other degree, diploma, associateship, fellowship or other similar titles. The assistance and help received during the course of investigation have been fully acknowledged.

(B.G.PATEL)
Major Advisor

(PRAGAYA DASHORA)
Minor Advisor

(I.N. PATEL)
Advisor

(M. K. CHAUDHARY)
Advisor

SARDARKRUSHINAGAR DANTIWADA AGRICULTURAL UNIVERSITY
ASPEE COLLEGE OF NUTRITION AND COMMUNITY SCIENCE
SARDARKRUSHINAGAR-385 506 (GUJARAT)

CERTIFICATE – II

Date : /10/2022

This is to certify that **VALAND URMILABEN RAMESHBHAI,** Department of Foods science and Nutrition, ASPEE College of Nutrition and Community Science, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar has made all corrections/modifications in the thesis entitled, **"ASSESSMENT OF NUTRITIONAL STATUS OF EARLY ADOLESCENT SCHOOL GIRLS IN DANTIWADA TALUKA OF BANASKANTHA DISTRICT, GUJARAT"** as suggested by the External Examiner and the Advisory Committee in the oral examination held on **/10/2021.**

(B. G. PATEL)
Major Advisor and Professor
Department of Foods Science and Nutrition
ASPEE College of Nutrition
and Community Science
S. D. Agricultural University
Sardarkrushinagar-385 506

(B. G. PATEL)
Professor and Head
Department of Foods Science and Nutrition
ASPEE College of Nutrition
and Community Science
S. D. Agricultural University
Sardarkrushinagar-385 506

(B. G. PATEL)
Principal
ASPEE College of Nutrition
and Community Science
S. D. Agricultural University
Sardarkrushinagar-385 506

APPROVED (Seal and Date)

(C. M. MURALIDHARAN)
Director of Research and
Dean, Post-Graduate Studies
S. D. Agricultural University
Sardarkrushinagar-385 506

CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

LIST OF MAP

LIST OF APPENDICES

ABBREVIATIONS USED

%	:	Percentage
$\bar{X}$	:	Arithmetic mean
$\sum$	:	Summation
BMI	:	Body Mass Index
et al	:	Co-worker
etc.	:	And other
F	:	Frequency
Fig.	:	Figure
i.e.	:	That is
IAP	:	Indian Academy of Pediatric
ICDS	:	Integrated Child Development Scheme
ICMR	:	Indian Council of Medical Research
kg	:	Kilogram
km	:	Kilometer
LDM	:	Long Duration Malnutrition
M	:	Meter
MDM	:	Mid Day Meal
N	:	Number of observation
NAC	:	National Advisory Committee
NCHS	:	National Center for Health Statistics
NFHS	:	National Family Health Survey
NNMB	:	National Nutrition Monitoring Bureau
OBC	:	Other Backward Class
PEM	:	Protein Energy Malnutrition
RDA	:	Recommended Dietary Allowance
SC	:	Schedule Caste
SD	:	Standard Deviation
SDM	:	Short Duration Malnutrition
SES	:	Socio Economic Status
ST	:	Schedule Tribe
Std.	:	Standard
UNICEF	:	United Nations international children's Emergency Fund
viz.,	:	Namely
WFP	:	World Food Programme
WHO	:	World Health Organization

VALAND URMILABEN R. **M.Sc. (Home Sci.)** **FOODS AND NUTRITION**
OCTOBER–2022

ASSESSMENT OF NUTRITIONAL STATUS OF EARLY ADOLESCENT SCHOOL GIRLS IN DANTIWADA TALUKA OF BANASKANTHA DISTRICT, GUJARAT

Name of Student	Major Advisor
VALAND URMILA R.	Dr. B. G. PATEL

DEPARTMENT OF FOODS SCIENCE AND NUTRITION
ASPEE COLLEGE OF NUTRITION AND COMMUNITY SCIENCE
SARDARKRUSHINAGAR DANTIWADA AGRICULTURAL UNIVERSITY
SARDARKRUSHINAGAR-385 506

ABSTRACT

The present study was conducted in Dantiwada taluka, Banaskantha district, Gujarat. Dantiwada taluka has 58 government schools out of which 15 schools was selected randomly by the simple random sampling method. Twenty respondents were randomly selected from each school for conducting the study. Total 300 respondents were selected by multistage random sampling for the study purpose.

The nutritional status of early adolescent girls was assessed using anthropometric measurements, clinical survey and dietary assessment. The personal and socio-economic status was also studied. The data obtained from the study was analyzed statistically by frequency, percentage and correlation.

The finding of the study revealed that majority of the early adolescent girls were age between 11 to 12 years, belongs to other backward class, having nuclear family and medium family size. The educational status of mother was low and they were engaged mostly with home maker cum agricultural labour and having annual income between < ₹2,05,000/- to ₹4,10,000/-.

The results revealed that height of the majority of respondents were between 145 to 150 cm, weight between 30 to 40 kg and most of the subjects were observed BMI between < 19.0 to 24.9. Various clinical signs or symptoms or irregularity of early adolescent girls was examined by clinically checked lack of luster, hair loss, brittle nails, cleft lip, carries, molted enamel and sings of observed.

Dietary information of the study subjects shows that a majority of early adolescent girls were vegetarian as their diet was also very simple. However, none of the early adolescent girls had taken any special food.

The food consumption pattern of the early adolescent girl showed that the consumption of various foods except pulses irregular and infrequent.

Wheat and bajra and rice were the staple cereal consumed throughout the year by all the early adolescent girls. The consumption pattern of pulses, root and tubers, other vegetable, milk product were founds to be very low among diet of the early adolescent girls, while green leafy vegetable were not included in their daily diet as consumption of these vegetables was largely depends upon the availability during

different seasons. Similarly, fruits were not included in their daily diet. They consumed mango, banana and guava as the main fruits, available in particular season at a cheaper rate. The consumption of animal food like meat, egg, fish or poultry was noticed only in few early adolescent girls.

A significant correlation was socio-economic variables between, caste, family size, occupation of mother and father, family annual income, types of house and numbers of children in family did not have any relationship with their nutritional status.

The results of this study showed that the early adolescent girls Dantiwada taluka are still living under the poor nutritional status. Therefore, such girls should be aware about the nutrition and its importance. Similarly, they should be taught about how to improve their health and nutritional status.

ACKNOWLEDGEMENT

I would like to express my sincere gratitude and gratefully admit my indebtedness to my major advisor **Dr. B. G. Patel,** Professor and Head, Department of Food Science and Nutrition, ASPEE College of Nutrition and Community Science, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, for her untiring guidance and constant encouragement with personal affection and providing all types of help during the period of completion of this investigation.

I would express my warm thanks to my Minor Advisor **Dr. Pragaya Dashora,** Professor and Head, Department of Human Development and Family Study, ASPEE College of Nutrition and Community Science, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar.

I would express my warm thanks to the member of my Advisory Committee **Dr. I. N. Patel**, Professor, Department of Food Science and Nutrition, ASPEE College of Nutrition and Community Science, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar for his kind support and giving his suggestions during finalization of thesis. I would also like to acknowledge my profound thanks to the members of my Advisory Committee, **Dr. M. K. Chaudhary**, Assistant Professor, Statistics, College of Basic Science and Humanities, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, for his kind co-operation during analysis of data of my research work.

My sincere thanks are extended to **Dr. R. M. Chauhan,** Honourable Vice-Chancellor and **Dr. C. M. Muralidharan,** Director of Research and Dean, Post-Graduate Studies, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar for providing me an opportunity to conduct the research study.

Mentioning “Thanks” is a taboo in friendship. But my conscience would not let me refrain from expressing my genuine gratitude toward my friends **Amisha, Maya, Saroj, Nituraj, Poonam, Neha, Urvashi, Jaspal,** and my senior cum friend **Seema Di** and **Tejsvita Di** and my lovely Junior **Vishvanshi** who supported me morally and emotionally throughout the study period which always keeps my spirit up at every critical juncture of my educational career.

Finally, I express my thanks to all family member, my parents, **"Shri Rameshbahi"** and **"Smt. Ramilaben**,**"** my brothers**, "Mukeshbhai," "Nielshbhai,"** my lovely sister cum friends **"Poonamben,"** for their unconditional trust and endless patience. Thank you for always being with me through good and tough times. I also want to thank my grandfather Hon'ble **"Shri Bhikhabhai,"** and grandmother **"Sardaben"** for their love and support.

For their help during survey**.** I wish to convey heartily thanks to the, **Ishvarkaka** and **Jesangkaka** who in spite of having loads of work helped me a lot to carry out research work.

Smt. K. Salat deserves very special mention of his hard work during nice computer setting of this dissertation.

This account will be incomplete without mentioning my adorable parents' in-law **"Shri Kamleshbhai"** and **"Smt. Kapilaben,"** my sister in-law **"Ashaben"** and brother in-low **"Bharatbhai"** for their love and support. I also thank my fiancé **"Sanjay Miyatra"** for his heart-warming kindness who always remained beside me during the happy and hard moments.

I would also take an opportunity to thank everyone who directly or indirectly helped me to carry out my research work. All might have not been mentioned, but none forgotten.

Place : Sardarkrushinagar **(VALAND URMILA)**
Date : -10-2022

I. INTRODUCTION

Adolescence is an important stage of growth and development in the lifespan. Unique changes that occur in an individual during this period are accompanied by progressive achievement of biological maturity. This period is very crucial since these are the formative years in the life of an individual when major physical, psychological and behavioral changes take place. Adolescent may represent a window of opportunity to prepare nutritionally for a healthy adult life.

Adolescence is a period of rapid growth and development, second only to infancy, with dramatic biological, psychological changes often shaped by socio-cultural factors. It is usually divided into two phases : early adolescence (10 to 14 years) and late adolescence (15 to 19 years) physiologically, the early years are dominated by pubertal changes and the later stages by sexual maturation and development of adult roles and responsibilities. The nutritional issues in this age group have commonalities with children and adults with some added dimensions of puberty, psychological changes, and growth spurt which are crucial for current, future and intergeneration health.

Nutritional status of adolescents is an important determinant of a nation's health. This stage of life is the foundation of better health of new generation which surpasses through parent generation. Unfortunately adolescents have been considered a low risk group for poor health and nutrition and often receive scant attention. Money and time may be the limiting factors about this concern.

Adolescent girls, constituting nearly one tenth of Indian population, form a crucial segment of the society. The girls constitute a more vulnerable group especially in the developing countries where they are traditionally married at an early age and are exposed to greater risk of reproductive morbidity and mortality. In general, adolescent girls are the worst sufferers of the ravages of various forms of malnutrition because of their increased nutritional needs and low social power.

Poor nutrition, on the one hand, can lead to delay or failure in achieving maturation with a stunted linear growth perpetuating the cycle of poverty and intergenerational under nutrition. On the other hand, there is an increased risk of

non-communicable diseases. The nutritional transition that is occurring in some low-middle income countries is resulting in a double burden of overweight and obesity in some population groups, along with the existing high proportion of under nutrition in others.

Adolescence growth and nutritional status are heavily influenced by the sexual maturation process, and thus cannot be accurately assessed without knowledge of the degree of sexual maturation. Up to (37%) of total bone mass, nutrition influences growth and development throughout infancy, childhood and adolescence; it is, however, during the period of adolescence that nutrient needs are the greatest.

So far most of the studies have been done in schools and rural areas. The findings of studies on school children cannot be extrapolated to adolescent girls, as their school enrollment is less. It is likely that girls not attending schools belong to disadvantaged segment of society and contribute significantly in domestic and peridomestic activities, there by jeopardizing their health.

Early adolescence is a period of rapid growth and maturation in human development. The nutritional status of adolescent girls, the future mothers, contributes significantly to the nutritional status of the community. Under nutrition among adolescent girls is a major public health problem leading on impaired growth. Nutritional deficiencies have far reaching consequences, especially in adolescent girls. If their nutritional needs are not met, they are likely to give birth to undernourished children, thus, transmitting under nutrition to future generations. Girls from disadvantaged backgrounds have poor nutritional status their weights and heights are lower than the well-to-do Indian counterparts. This age group needs special attention because of the turmoil of adolescence which they face due to the different stages of development that they undergo, different circumstances that they come across, their different needs and diverse problems. Despite all these important considerations, adolescent girls did not receive adequate attention in rural areas in our country.

The World Health Organization (WHO, 2019) defines adolescence as 10 to 19 years. It is a key decade in the life course with implications on adult health, socio-economic well-being of a country and even the health of the future children. Adolescents comprise 16 per cent of the total world population. Asia has more than

half of the world's adolescents while according to the Census 2011, 20 per cent of India's population are adolescents.

India is home to 253 million adolescents (10 to 19 years) and with them at a crossroad between losing out on the potential of a generation and nurturing them to transform society. As adolescents flourish, so do their communities and all of us have a collective responsibility to ensure that adolescence is an age of opportunity. The National Family Health Surveys (NFHS) in India apply adult cutoffs of nutritional status for the estimation of under nutrition/overweight in the 15 to 19 age groups. The prevalence of thinness in boys and girls thus estimated is (58.1%) and (46.8%) in NFHS-3 and (45.00%) and (42.00%) in NFHS-4, respectively.

Adolescence is a nutritionally vulnerable time when rapid physical growth increases nutrient demands. Dietary behaviors established in adolescence may contribute to nutrition-related problems that have consequences for long-term health (UNICEF, 2020).

In India, 40 per cent of girls and 18 per cent of boys are anaemic. Anaemia among adolescents adversely affects growth, resistance to infections, cognitive development and work productivity. In response to the problem, the national Ministry of Health and Family Welfare (MoHFW) launched a nationwide Weekly Iron and Folic Acid Supplementation (WIFS) programme in January, 2013. The programme builds on 13 years of evidence-generation through pilots and phased scale-ups by UNICEF on the use of weekly iron and folic acid supplementation to address anaemia in adolescent girls in different Indian states. Services delivered under the scheme include weekly iron and folic acid supplementation; bi-annual deworming; and nutrition counseling about how to improve diet, prevent anaemia and minimize the potential side-effects of IFA supplementation and deworming (UNICEF, 2020).

According to UNICEF, India has been the partner of choice in supporting the universal roll-out of the Weekly Iron and Folic Acid Supplementation Programme in 14 major states in India, which jointly are home to 88 per cent of India's adolescent girls. The focus areas are convergent planning and development implementation protocols, development of training tools, capacity-building of field workers, developing external field monitoring and feedback loop review mechanisms and developing communication strategies and materials for mass awareness.

Total 253 million adolescents in India, 56 per cent are girls living below the poverty line. Anemia among these girls adversely affects their growth, resistance to infections, cognitive development and work productivity. With a holistic approach to the healthcare of adolescent girls, Smile Foundation with the support of PepsiCo Foundation has initiated a nutrition enhancement program called 'Sampoorna' (meaning 'complete or whole') in Banaskantha district, Gujarat. The project is working to improve the health and nutrition levels of at least 1,000 poorest of the poor adolescent girls across 10 villages in the Banaskantha district.

Dantiwada is a taluka located in Banaskantha district of Gujarat. It is one of 14 taluka's of Banaskantha district and there are 57 villages. According to 2011 census of India, total Dantiwada population is 115,221 people are living in this taluka, of which 59,846 are male and 55,375 are female. Population of Dantiwada in 2021 is 142,874. Literate the male literacy rate is 64.07 per cent and the female literacy rate is 39.60 per cent in Dantiwada taluka. Total workers are 43,769 depends on multi-skills out of which 30,198 are men and 13,571 are women. Total 14,977 Cultivators are depended on agriculture farming out of 13,669 are cultivated by men and 1,308 are women. About 8293 people works in agricultural land as a labor in Dantiwada, men are 5,942 and 2,351 are women. Keeping in view, the present study has been elucidated to “Assessment of nutritional status of early adolescent school girls in Dantiwada taluka of Banaskantha District.”

Objectives of the study

Present study was conducted with the following objectives.

(1) To study personal and socio-economic information of the respondents
(2) To assess the anthropometric measurements of the respondents
(3) To examine clinical signs and symptoms of the respondents
(4) To study the dietary pattern of the respondents
(5) To study the association between personal socio-economic determinants and nutritional status of the respondents

II. REVIEW OF LITERATURE

Adolescence is a crucial period of nutritional vulnerability due to increased dietary requirements for growth and development. Iron needs are elevated as a result of intensive growth and muscular development, which implies an increase in blood volume; thus, it is extremely important for the adolescent's iron requirements to be met. Diet, therefore, must provide enough iron and, moreover, nutrients producing adequate iron bioavailability to favor element utilization and thus, be sufficient for needs at this stage of life. Currently, many adolescents consume monotonous and unbalanced diets which may limit mineral intake and/or bioavailability, leading to iron deficiency and, consequently, to ferropenic anemia, a nutritional deficit of worldwide prevalence. Iron deficiency, apart from provoking important physiological repercussions, can adversely affect adolescents' cognitive ability and behavior.

Various studies conducted on nutritional status in early adolescent girls are reviewed and presented in this chapter under the following heading.

2.1 Study personal and socio-economic information of the respondents

2.2 Assess the anthropometric measurements of the respondents

2.3 Examine clinical signs and symptoms of the respondents

2.4 Study the dietary pattern of the respondents

2.5 Study the association between personal socio-economic determinants and nutritional status of the respondents

2.1 Study personal and socio-economic information of the respondents

Cross sectional study conducted by Dayanand *et al*. (2020) on nutritional assessment of early adolescent from largest tertiary care centre of Gujarat. The result shows that study group comprised of 190 early adolescent (114 boys and 76 girls). Overall prevalence of malnutrition, thinness and underweight was (66.30%), (56.80%) and (9.50%), respectively. Girls were affected. More as compared to boys. Malnutrition was more common in lower socio-economic class and those whose mothers were either illiterate or had primary level of education two-third girls (63.00%) and around half of boys were anaemic. Deficiency of Vitamins A, B and C were found in (7.30%), (8.90%)

and (0.10%), respectively and dental caries, refractive errors and skin problems occurred in (17.89%), (5.26%) and (9.40%) children.

Anita Pandey (2019) conducted the study on nutritional status of rural adolescent school girls in district Raigarh, Chhattisgarh. Result reveled that about (47.00%) families were nuclear, while about (53.00%) were joint families. Majority of the girls belonged to low income families (50.05%). The percentage of families belonging to agriculture has been (24.50%), (14.00%) families depended on seasonal small businesses. Rest (10.50%) belongs to the facilities who work in government or semi government sector. Thus in total (86.00%) of the families belong to low income group (57.25%) families are vegetarian, rest (42.75%) are non-vegetarian.

A cross sectional study conducted by Deekala and Kokku (2018) on nutritional status in adolescent girls residing in social welfare hostels in Tirupati town. More than half (54.10%) of the adolescent girls were underweight (61.40%) of them studying 1st and 2nd years of their graduation (52.20%) of them belonged to upper lower class according to modified Kuppuswamy classification, 2016 (76.00%) of adolescent girls belonged to the family size of less than or equal to five (44.10%) has one sibling (33.00%) of the adolescent girls use nutritional supplements (59.70%) of adolescent girls has junk food once a week (56.10%) of them routinely involve in moderate physical activity (4.10%) of them who attained menarche do not practice menstrual hygiene. Majority (62.30%) of them visited health center for 1 to 5 times in the past one year (71.50%) of them does not practice deworming (5.90%) observed worms in their fecal matter (19.70%) of the adolescent girls have vision problems (67.30%) of adolescent girls have awareness regarding nutritional health. Only (28.20%) of adolescent girls get cosmetic charges from government.

Joshi *et. al.* (2015) conducted a study on nutritional status of adolescent girls in rural area in Bhopal district. Result shows that among all adolescent girls (69.00%) suffered from under nutrition. Only (31.00%) girls had normal nutritional status. Majority (87.20%) of adolescent girls belonging to the age group of 10-14 years were undernourished. There was a significant association between socio-economic status (SES) and nutritional status of adolescent girls.

Guduri *et.al*. (2014) carried out the study assessment of nutritional status among early Adolescent Girls (11 to 14 years) Attending Government Schools of

Visakhapatnam City results revealed nearly 3/4th (76.46%) of study population were in the age group of 12 to 13 years and their mean age was found to be (12.67%) years. Almost (78.00%) were Hindus, (16.60%) were Christians and the rest were Muslims by religion. Regarding educational status of the mother, (42.00%) stated that their mothers were illiterates and 1/3rd (33.00%) had secondary level of education. Among the mothers of the study subjects, 38 were unemployed and (54.00%) were engaged in semi-skilled work like sweeping, domestic help, working in pan shops *etc.* One mother was a teacher by occupation.

2.2 Assess the anthropometric measurements of the respondents

Cross-sectional Analysis conducted by Shah (2021) on nutritional Status, knowledge and Uptake of nutritional services among adolescent Girls in Western India. The results revealed that mean age of the study population was (13.82 ± 2.31) of the total, around (34.00%) of the adolescent girls were out-of-school. The prevalence of underweight (< -2SD) was (19.60%), (8.90%) were overweight and (2.60%) were obese. The mean BMI was 19.77 ± 2.42 kg/m², and height was 149.15 (2.23 m²). In terms of knowledge, almost (79.60%) were unaware of iron deficiency anaemia, about (70.00%) were not aware of hemoglobin test and (44.00%) did not know the benefit of using sanitary napkins. In addition, uptake of nutritional and health services was limited. The study found a statistically significant association of age the number of family members (0.10%), knowledge (0.50%), and use of toilet (0.40%) with low-BMI.

A School based comparative study conducted by Hiremath *et al.* (2020) on assessment of the nutritional status of female adolescents across rural and urban areas of Belagavi and found that in the urban population, nearly half of the study population (47.27%) subjects, were underweight, whereas in the rural population (70.90%) were underweight. The mean energy intake was 2194.32 ± 140.79 Kcal and 1993.49 ± 146.14 Kcal in the urban and rural populations, respectively.

Ramamani and Suganya (2018) conducted the study on BMI and WHR assessing the nutritional status of adolescent girl's. The mean age of the participants was 14 ± 2.9 years. Number of participants, who were normal, underweight, overweight, and obese based on BMI values were 227, 5, 301 and 447, respectively. According to the WHtR, 560 (57.00%) of them were obese, while 420 (43%) were non-obese. Moderate correlation exists between BMI and WHtR, with r = 0.68.

Rani *et al.* (2018) conducted a study on assessment of nutritional status of teenage adolescent girls in urban slum of Varanasi. Nutritional status was assessed by anthropometric measurements. Result shows that (60.30%) of adolescent girls were undernourished (35.20%) were normal and only (4.60%) were overweight. age and socio economic status of adolescent girls were significantly associated with their nutritional status ($P < 0.05$).

Sridhar and Gauthami (2017) conducted a study on nutritional status of adolescent tribal girls a community based study. Result shows that Majority of the study subjects (59.10%) were from Lambadi tribe, followed by Chenchu (35.80%) and Yerukala (5.20%). Mean height was observed to be less than that of 50^{th} percentile (according to NCHS standards) in the respective age. Stunting was observed in younger age group *i.e.* 10-13 years (17.40%) and it was found to be statistically significant. in present study (44.00%) were anemic with mean Hb of (12.50%) and (56.00%) had normal hemoglobin levels (>12 g/dl), (38.10%) were mildly anemic and (5.90%) moderately anemic. There were no severe cases of anemia.

Cross-sectional study conducted by Swetha and Ranganath (2016) on morbidity profile and its relationship with the nutritional status, among adolescent school girls Bangalore city. Result revealed that the mean age of girls was 13.79 ± 0.85 years. Mean height of girls was 153.63 ± 9.95 cm, mean weight 42.7 ± 8.93 kg, and mean body mass index 18.03 ± 3.23 kg/m² 324 (64.80%) girls had healthy weight and 137 (27.40%) were underweight. Stunting in 67 (13.40%) girls. A total of 304 adolescent girls (60.80%) had morbidity at the time of our visit to schools. Significant morbidity history in the past 2 years was seen in 51 (10.20%) girls.

Trivedi *et al.* (2016) conducted a study on studied on assessment of nutritional status of adolescent field experience from rural Gujarat India. Result shows that, out of total 821 adolescents, 690 (84.00%) school-going and 131 (16.00%) non-school-going adolescents screened, (17.00%) were severely thin and only about half had normal BMI. Less than a percent were overweight. Prevalence of anemia was (6.00%) in girls and (3.00%) in boys. Present study documents poor nutritional status of adolescents in rural Gujarat; narrates an urgent need for better nutrition to combat the problem of under nutrition amongst adolescents. Present study also reinforces a need for further research and documentation of nutritional status of adolescents to enhance current interventions in the field of ad adolescent health.

Sachan *et.al.* (2012) carried out study nutritional status of school going adolescent girls in Lucknow district. Results relieved that the mean weight in all age groups in both urban and rural schools showed significant difference with the ICMR mean weight for respective ages except in ages 18 and 19 years in urban school girl's and in ages 10 and 19 years in rural school girls. The mean height in all age groups in both urban and rural schools showed significant difference with the ICMR mean height for respective ages except in ages 18 and 19 years in urban schools and in ages 16, 17, 18 and 19 years in rural schools. Overall prevalence of thinness was found to be (17.00%) and (11.40%) (BMI 85th percentile according to NCHS-CDC reference) among urban and rural school going adolescent girls, respectively.

Maiti *et al*. (2011**)** conducted a study on assessment of nutritional status of rural early adolescent school girls in Dantan-II block, Paschim Medinipur District, West Bengal and the results revealed that the weights and heights of these girls were below those of standard value. As regards weight for age index, only (28.20%) subjects were in the normal category and the percentage of subjects suffering from grade I (25.70%), grade II (30.40%), grade III (13.70%) and grade IV (1.90%) malnutrition was quite prevalent in present study. With respect to height for age index, (65.20%) of the subjects were in the normal category, (32.60%) had mild retardation and about (2.20%) had poor status.

2.3 Examine clinical signs and symptoms of the respondents

Phuljhele *et al*. (2021) conducted study on assessment of nutritional status of adolescent girls aged between 15 to 19 year studding in government high school in Raipur Chhattisgarh India. Result shows that 480 girls were interviewed. As per WHO nutritional measurement criteria, adolescent girls were classified as per their anthropometric criteria, (50.63%) of girls were moderately stunted had severe stunting (7.29%) of girls were in the category of severe thinness, (36.00%) had thinness and (9.37%) were overweight (28.12%) had conjunctiva pallor (anemia), (4.80%) had dental caries, (1.46%) had vitamin 'B' complex deficiency and (1.40%) had signs of vitamin 'A' deficiency.

Vasundara (2020) assessed the study nutritional status of adolescent Girls Residing in the Urban Field Practice Area of S.N. Medical College, Bagalkot results revealed that the prevalence of thinness and stunting was found to be (25.80%) and (29.30%), respectively. Anemia was the predominant micronutrient

disorder observed in this study (55.50%) followed by baldness of tongue (3.50%), goiter (2.00%), koilonychias (1.50%), angular stomatitis (0.30%) and none had Bitot's spots (21.33%) and spongy bleeding gums (18.67%). Mean energy intake and several micronutrients were lower than recommended values.

Dutta *et al*. (2017) conducted study on carried out on Nutritional Status of Adolescent School Girls of Uttarakhand. Results revealed that three percent of the subjects were severely undernourished, 11.67 percent were moderately undernourished, twenty-one percent were stunted and 21.33 percent were thin. No significant association was found between BMI and variables such as age, family type, family income, food habits and meal pattern. Significant clinical symptoms were pale conjunctiva (24.33%), mottled teeth (23.33%) and cavities in teeth.

2.4 Study the dietary pattern of the respondents

Giri (2022) conducted study on nutritional status assessment of rural adolescent girl Child In Contai, Purba Medinipur, West Bengal. Result is showing that (11.20%) students are suffering from underweight and having (< 18.50%), BMI, but (66.10%) students have normal BMI and (18.00%) students are overweight and (4.50%) student are obese they are consuming more carbohydrates than RDA and less protein.

Agustina *et al.* (2020) conducted a survey on associations of meal patterning, dietary quality and diversity with anemia and overweight-obesity. They concluded that the girls had poor dietary quality and diversity and the findings indicated the importance of improving dietary quality and diversity in a regular meal pattern, especially meal frequency and meal skipping, to reduce the risk of anemia and overweight-obesity among adolescent girls.

Kaur *et al.* (2020) conducted on exploring gender disparity in nutritional status and dietary intake of adolescents in Uttarkashi. Results show an increasing trend of mean height and weight of adolescent boys and girls with advancing age. Gender-wise, however, boys had higher prevalence of underweight than girls, whereas girls were slightly more stunted compared to boys. The dietary intake of energy, iron, calcium and protein was significantly higher in boys than their female counterparts. Despite an advantage in terms of dietary intake, an enhanced prevalence of underweight among boys may be attributed to difference in physical activity between both sexes, owing to gendered cultural setting.

Konwar *et al.* (2019) conducted the study on nutritional status of adolescent Girls belonging to the tea Garden Estates of Sivasagar district, Assam, India result revealed that The prevalence of thinness and stunting across 265 adolescent girls was (49.40%) and (50.60%), respectively. Calorie and protein deficits were found to be (76.60%) and (65.00%), respectively. Majority of the respondents (66.80%) of the participants had a poor intake of essential food constituents. Moreover (76.21%) of the respondents were anemic. The association of different socio-demographic factors with thinness, inadequate protein intake and anemia were found during the study.

Kumar and Mishra (2019) carried out studied on nutritional status and dietary pattern of adolescent girls. Results revealed that the dietary pattern indicated poor consumption of milk, fruits and leafy vegetables. Majority of them were vegetarian, while some of them were non-vegetarian and also the nutrient intake and age groups, there is a significant difference with all the macronutrients and micronutrients intake of the adolescent's girls. They concluded that the majority of adolescent girls were not aware about their nutritional status healthy dietary habits and thus appropriate interventions should be done to improve the nutritional status of adolescent girls.

Patil *et al.* (2018) conducted a study on nutritional status and psychological impairment in rural adolescent girls : Pilot Data from "KOKAN" Region of Western India. Found that the mean age of the girls was 14 years with a standard deviation of 1.5 in all 35/76 (46.10%) could be classified as psychologically impaired. There was a high prevalence of micronutrient deficiencies with varying degrees. More than (65.00%) were deficient in calcium, zinc and folic acid. About (22.00%) were anemic and (36.00%) were vitamin B_1 deficient. More than (75.00%) had a low recommended dietary allowance (RDA) of macronutrients. Those with poor serum calcium concentration had higher psychological score ($P < 0.05$). Fat and calcium intakes were inversely associated with psychological score ($P < 0.05$ and $P < 0.001$, respectively). Odds ratios for psychological impairment were significant for those with low calcium levels [1.47 (95% CI 1.21, 4.31)], and for those with low calcium intake 1.43 (1.08, 3.19) and low iron intake 3.04 (1.02, 9.26).

Ramya and Thomas (2015) conducted a study on nutritional status and dietary pattern of adolescent girls of Kottayam taluka. Found that the frequency of intake of

leafy vegetables and fruits was very less. Meal skipping was observed among (40.80%) of the respondents and mostly (62.20%) skipped breakfast. Intake of protein, fat and calcium were at par with Recommended Dietary Allowance whereas consumption of energy, iron, vitamin 'C' and folic acid was significantly lower than the RDA.

A community-based cross-sectional study conducted by Naik and Mallapur (2014) on nutritional status of adolescent girls residing in rural area. The mean age among the study population was 12.9 ± 2.06 years. Majorities (73.5%) of them were Hindus, (98.5%) were literate and (90.00%) were currently studying. Adolescent girls between 10 and 14 years were more stunted (63.82%) as compared to 15 to 19 years (40.84%) (0.0003) and thin (60.79% vs. 39.43%; 0.90%). Overall, the mean calorie intake was observed to be 1272.20 ± 133.28 kcal/day, protein intake was 40.99 ± 3.32 g, and iron intake was 14.42 ± 2.58 mg.

2.5 Study the association between personal socio-economic determinants and nutritional status of the respondents

Gayathri *et al*. (2021) conducted study on nutritional status and body image satisfaction among adolescent girls result reveled that majority (63.70%) of them having normal nutritional status, (17.80%) of them were mild thinness, (8.90%) were overweight (7.40%) of them were showing severe thinness and only (2.20%) of them were obese. Among that majority (57.80%) had mild concern (8.90%) of them having moderate concern and (2.20%) of them having marked concern regarding the body image irrespective of their BMI. And also there was highly statistically significant association between nutritional status and body image satisfaction.

Cunningham *et al*. (2020) conducted the study on adolescent girls' nutritional status and knowledge, beliefs, practices, and access to services : an assessment to guide intervention design in Nepal result revealed that the prevalence of underweight was highest in younger adolescents, whereas the prevalence of overweight/obesity in mothers was double that of the other 2 groups. Younger adolescents were in school, but fewer owned a mobile phone or had radio access. Exposure, knowledge, and behaviors across thematic areas also differed by stage of adolescence.

Bhargava *et al*. (2020) conducted the study on nutritional status of Indian adolescents (15-19 years) from National Family Health Surveys 3 and 4 Revised estimates using WHO 2007 Growth reference result reveled that prevalence of thinness in boys and girls thus estimated is (58.10%) and (46.80%) in NFHS-3, and (45.00%) and (42.00%) in NFHS-4, respectively. But the WHO recommends using age and sex-specific reference for adolescents. We reanalyzed the nutritional status of the adolescents using the WHO, 2007 growth reference to obtain revised estimates of thinness, overweight and stunting across states, rural-urban residence, and wealth quintiles.

Malenahalli *et al.* **(**2017) conducted the study on Nutritional status in adolescent girls : attempt to determine its prevalence and its association with socio-demographic variables results relieved that we found (36.20%) of adolescent girls were malnourished, among whom (33.70%) were obese and (66.30%) were undernourished.

Venugopal *et al.* (2016) conducted on Growth pattern and nutritional status of adolescent girls of Chhattisgarh. Results revealed that girls of 12 years had highest (37.80%) prevalence of under nutrition. The overall prevalence of under nutrition was (64.70%), respectively.

Kankana (2016) conducted the study on nutritional status and monarchial age of rural adolescent girls of Salboni block of Paschim Medinipur, West Bengal India. Among studied sample 896 girls had experienced menarche, their mean age at menarche is 11.88 years (1.23). At 10 mean height of pre-menarche girls is 145.88 cm, post monarchical girls is 146.33 cm), Body mass Index had increased progressively from 13 years to 19 years of age where overall increase was (1.89 kg/m^2) from 10 to 19 years which is statistically significant with age ($f = 17.3$, $P < 0.001$).

Joshi *et al.* (2014) conducted a study on nutritional status of adolescent girls in rural area of Bhopal district. Found that amongst all adolescent girls (69.00%) suffered from under nutrition. Only (31.00%) girls had normal nutritional status. Majority (87.20%) of adolescent girls belonging to the age group of 10-14 years were undernourished.

III. METHODOLOGY

The present investigation, “Assessment of nutritional status of early adolescent school girls in Dantiwada taluka of Banaskantha district, Gujarat" was carried out in Dantiwada taluka, Banaskantha District. The methodology used for the study is narrated in this chapter. The chapter is divided under the following sections and accordingly discussed in detail as under.

3.1 Location of the study

3.2 Selection of villages

3.3 Selection of respondents

3.4 Construction of the interview schedule

3.5 Assessment of personal and socio-economic status

3.6 Assessment of nutritional status

3.5.1 Anthropometric measurement

3.5.2 Clinical examination

3.5.3 Dietary assessment

3.6 Statistical analysis

3.1 Location of the study

The present study was conducted in Dantiwada taluka, Banaskantha district, Gujarat. Dantiwada taluka has 58 government schools, out of which 15 schools was selected randomly by the simple random sampling method. Twenty respondents were randomly selected from each school for conducting the study. Total 300 respondents were selected by multistage random sampling for the study purpose.

3.2 Selection of villages

Dantiwada taluka consists of 57 villages, out of which 15 villages having school were randomly selected for conducting the study which is shown in Table 3.1.

Table 3.1 : Information about selected schools for the study

Sr. No.	Taluka	Name of the school		Number of respondents
1	Dantiwada	1.	Dantiwada pay center school	20
		2.	Sarvoday primary school Jegol	20
		3.	Dhaneri primary school	20
		4.	Chodugiri primary school	20
		5.	Shri Sharda Vidhyamandir Ghodh school	20
		6.	Vaghrol primary school	20
		7.	Gangapura (Shikariya) primary school	20
		8.	Lodpa primary school	20
		9.	Jorapura (Lodpa) primary school	20
		10.	K.D. Chaudhary Sanskar pri.vidhayalay school Pathawada	20
		11.	Durbargad (Bhakher) Primary school	20
		12.	Vedavas primary school	20
		13.	Marwada primary school	20
		14.	Moti mahudi primary school	20
		15.	Kotada (Jegol) primary school	20
			Total	**300**

3.3 Selection of respondents

The sample for the study comprised of early adolescent girls of Dantiwada taluka. For the study purpose early adolescent girls belonging to age group of (11 to 14 years) girls were randomly selected from the selected school of above villages. Total 300 early adolescent girls were enrolled for the study.

3.4 Construction of the interview schedule

To collect the data about independent and dependent variables, the pre-structured interview schedule was developde. The interview schedule developed by the investigator consisted three parts, personal and socio-economic characteristics, dietary pattern and nutritional knowledge.

3.4.1 Assessment of personal and socio-economic status

The data was collected through personal interview. A self-structured interview scheduled (Appendix-A) was used to gather information, personal and socio-economic profile such as age, religion, education, occupation, type of family, family income and other factors affecting the nutritional status of adolescent girls.

3.5 Assessment of nutritional status

The nutritional status of early adolescent girls was assessed by anthropometric measurements, clinical signs and symptoms, and 24-hour dietary recall method.

3.5.1 Anthropometric measurements

A change in body dimensions reflects the overall health and welfare of individual and population. Anthropometry is used to assess and predict performance, health and survival of individuals and reflect the economic and social well-being of population. Anthropometry is widely used, inexpensive and no-invasive measure of the general nutritional status of an individual or populations group. The physical examination emphasized the measurement of height, weight and BMI calculated.

(a) Weight

Body weight is the most widely used and the simplest reproducible anthropometric measurements for the evaluation of nutritional status. A portable digital weighing scale (Bathroom scale) with accuracy 0.1 kg was used to record the weight of the respondents. Checking the scale with a known weight was done frequently and adjustment to zero was done every time for accurate reading. Respondents were made to stand straight on the platform of the weighing machine with barefoot and minimum clothing.

(b) Height

Height of each respondent was measured in centimeter; the height was measured using a stadiometer. Height was read to the nearest 0.1 cm. The respondents were made to stand erect with barefoot on a flat floor against a wall with feet parallel and heels, buttocks, shoulder and back of the head and hands hanging on the sides.

(c) Body Mass Index (BMI)

Body mass index (BMI) was calculated using the formula, that is, weight in kilograms divided by height in meter square (kg/m^2) to determine if, weight is appropriate for height.

$$BMI = \frac{\text{Weight (kg)}}{\text{Height } (m^2)}$$

Assessment of BMI of adolescent girls was done according to WHO classification which is shown in Table 3.2.

Table 3.2 : Weight status categories of early adolescent girls as per WHO (2019)

Weight status category	BMI (kg/m^2)
Under weight	< 19.0
Normal	19.0-24.9
Over weight	25.0-29.9
Obesity I	30.0-34.9
Obesity II	35.0-39.9
Obesity III	≥ 40.0

3.5.2 Clinical examination

Clinical examination assesses levels of health of individuals or of population groups in relation to the food they consume. It is the simplest and practical method. When two or more clinical signs of a deficiency disease are present simultaneously, their diagnostic significance is greatly enhanced. Examination of clinical signs and symptoms for nutritional deficiencies were recorded as per the procedure recommended by Park and Park (1980) and Jelliffe (1966).

Deficiency signs observed as shown in Appendix-II were recorded as per below.

(a) Protein deficiency

Easy pluck ability of hair, thin and sparse hair, dyspigmentation of hair, flag signs and lack of lusterness, flaky paint dermatitis, diffuse pigmentation of the skin.

(b) Iron deficiency

Pale conjunctiva, koilonychias (spoon shaped nail), atrophic papillae of tongue, pale face and pale skin, pale tongue, brittle, ridges and paleness of nails.

(c) Riboflavin deficiency

Angular stomatitis, cheilosis, magenta tongue, atrophic papillae naso-labial dyssebacea and angular scars.

(d) Niacin deficiency

Pellagrous dermatitis, scarlet tongue, tongue fissuring and red edges of tongue, atrophic papillae, thickening and pigmentation of tongue.

(e) Vitamin 'A' deficiency

Xerosis of skin, follicular hyperkeratosis, conjunctiva xerosis, Bitot's spots, corneal Xerosis, scleral pigmentation, keratomalacia.

(f) Vitamin 'C' deficiency

Spongy (Swollen) gums, bleeding gums, follicular hyperkeratosis.

3.5.3 Dietary assessment

Diet survey is an important part in any study of nutritional status of individual or groups providing essential information on nutrient intake levels, sources of nutrient, food habits and attitudes.

Diet is important determinant of health and nutritional status of people. The dietary habits of individual, families, communities differ according to socio-economic factors, regional customs and traditions. An understanding in the gaps or excesses in the diet would help in planning diets to overcome diet related morbidities and thus promote health of the people.

(a) 24-hour dietary recall method

Food consumption is one of the important determinants of nutritional status, hence dietary assessment forms an integral part of nutrition survey. In the present study, through the 24-hour dietary recall method, the amount of raw ingredients used for cooking and the total amount of food consumed by the individuals were asked and recorded.

3.6 Statistical analysis

The data obtained during the study were classified, tabulated, processed and analyzed with descriptive statistics, correlation and sampling techniques (Rangaswami, 2010). The data were statistically analyzed by using SPSS 20 software.

3.6.1 Percentage

To classify the early adolescent girls to interpret their socio-economic characteristics and anthropometric measurements percentage was used.

3.6.2 Mean ($\overline{X}$)

This technique was used for classification of the early adolescent girls into different categories. This was obtained by total score divided by the numbers of the early adolescent girls.

$$\bar{X} = \frac{\sum X_i}{n}$$

Where,

$\bar{X}$ = Arithmetic mean,

X_i = Observed value, and

n = Number of observation.

3.6.3 Standard Deviation (S.D.)

For the comparison of food and nutrient intakes of the subjects with RDA standard deviation was calculated by using following formula.

$$SD = \sqrt{\frac{\sum (X_i - \overline{X})^2}{n - 1}}$$

Where,

$\overline{X}$ = Arithmetic mean,

X_i = Observed values of variable,

SD = Standard Deviation, and

n = Number of observation.

3.6.4 Correlation Coefficient

To test the correlation between independent and dependent variable Pearson correlation.

$$\mathbf{r} = \frac{\sum x_i y_i}{\sqrt{\sum x_i^2 \sum y_i^2}}$$

Where,

R = Coefficient of correlation,

$\Sigma x_i y_i$ = Corrected sum of product between variables X and Y,

Σx_i^2 = Corrected sum of square for variable X and

Σy_i^2 = Corrected sum of square for variable Y.

V. SUMMARY AND CONCLUSION

This age group needs special attention because of the turmoil of adolescence which they face due to the different stages of development that they undergo, different circumstances that they come across, their different needs and diverse problems. Despite all these important considerations, adolescent girls did not receive adequate attention in rural areas in our country.

Adolescence is a period of rapid growth and development, second only to infancy, with dramatic biological, psychological changes often shaped by socio-cultural factors. It is usually divided into two phases : early adolescence (10 to 14 years) and late adolescence (15 to 19 years) physiologically, the early years are dominated by pubertal changes and the later stages by sexual maturation and development of adult roles and responsibilities.

Dantiwada is a taluka located in Banaskantha district of Gujarat. It is one of 14 taluka's of Banaskantha district and there are 57 villages. The total population of Dantiwada Taluka is 115,221. As per Census 2011, total families in Dantiwada are 20852. The total literacy rate of Dantiwada Taluka is 52.3 per cent. The male literacy rate is 64.07 per cent and the female literacy rate is 39.6 per cent in Dantiwada Taluka. Keeping in view, the present study has been elucidated to Assessment of nutritional status of early adolescent school girls in Dantiwada taluka of Banaskantha District.

In view of this, a field-based research work was planned in Dantiwada taluka of Banaskantha district entitled Study on, "**Assessment of nutritional status of early adolescent school girls in Dantiwada taluka of Banaskantha District, Gujarat"** to explore and gather qualitative and quantitative results to get the accurate picture of the problem.

Objectives of the study

Present study was conducted with the following objectives.

(1) To study personal and socio-economic information of the respondents
(2) To assess the anthropometric measurements of the respondents
(3) To examine clinical signs and symptoms of the respondents
(4) To study the dietary pattern of the respondents

(5) To study the association between personal socio-economic determinants and nutritional status of the respondents

The study was carried out at Dantiwada taluka to obtain, nutrition status of early adolescent girls from age of 11 to 14 years. The simple random sampling was used for selecting the sample from the total population. The questionnaire method was implemented for collecting the information regarding personal, socio-economic and dietary pattern. Personal health related clinical signs or symptoms among the early adolescent girls were observed. Anthropometric data of the adolescent girls were collected by physical body measurements like height (centimeter) and weight (kilogram).

The key focus of the present study was to analyze the personal and socio-economic profile, health information, and personal health related clinical signs/symptoms/irregularity, anthropometric measurements in early adolescent girls. The major findings from research study found are as under.

The standard IBM SPSS 20 software was used to analyze the data. Mean, percentage, standard deviation, frequency and correlation coefficient were calculated to analyze and interprets the data. The major results exposed from the current study are as follow.

Socio-personal factors

The data obtained for personal and socio-economical background of early adolescent girls revealed that majority (51.30%) of the early adolescent girls were belongs to age group of 11 to 12 years. less than (31.70%) girls belong to the age group of 12 to 13 years, and very little (17.00%) girls belong to the age group of 13 to 14 Out of total populations (66.30%) early adolescent girls belongs to OBC category, more than (25.00%) early adolescent girls were belongs to SC category, more than (4.70%) early adolescent girls were ST and few (4.00%) were belongs to general category.

The data obtained for personal and socio economical background of early adolescent girls revealed that majority of early adolescent girls belonged to medium socio-economic background. More than half early adolescent girls were living in nuclear families and had more than two siblings. Education level of both mothers and fathers was observed low but father’s education level was much good as compare to mother’s education level the families of early adolescent girls were mostly engaged in farming and animal husbandry and living in pucca houses.

Annual income of most of the families of early adolescent girls was recorded well which was less than 2,05,000.

The results revealed that more than (55.70%) of the early adolescent girls were having height greater than 145 cm. Further, it was noted that weight of the almost 53.00 per cent early adolescent girls were 30 to 40 kg. The results of BMI showed that 84.70 per cent of respondents having the BMI less than 19.

Personal health related clinical signs or symptoms or irregularity of adolescent girls showed that were almost 35.00 per cent girls had lack of luster in hair. Many of girls had carries of teeth. Many girls had spoon shape nails and brittle nail.

The results revealed that more than (93.00%) girls were vegetarian and few were non vegetarian.

It was found that among the cereals which were consumed daily by the early adolescent girls were wheat and corn. Pulses and legumes were consumed twice in a week. The consumption patterns of green leafy vegetables showed that 73.00 per cent was consumed it once a week and 11.00 per cent girls consumed seasonally or occasionally. Roots and tubers were consumed daily by 79.00 per cent. Onion and potato was consumed daily. Adolescent girls was not consumed fruits daily, but consumed it seasonally or available at cheap rate. Milk and milk products were consumed it daily only by few early adolescent girls.

From above findings adolescent girls belongs to low economic group, poverty and lack of knowledge about nutrition.

The daily meal patterns of the early adolescent girls revealed that chapattis/rotla with tea was the item included in the breakfast. Chapattis and rotla, other vegetables, rice were found to be the major food items included in the diet. In the evening time very less adolescent girls consumed tea. At the dinner time chapattis or rotla, chutney, kadhi, khichdi were consumed by the early adolescent girls. The average nutrient intake of adolescent girls was very less.

Correlation between socio-economic status and anthropometric measurement of early adolescent girls

The data obtained for socio-personal profile of adolescent girls revealed that majority of adolescent girls belonged to low socio-economic background. The data findings of correlation between socio-personal profile and height, weight and BMI of early adolescent girls were highly significant relationship with age; Family type had negatively significant relationship with height weight and BMI. Education of

father and education of mother is positive significant relationship with weight and BMI.

The average intake of nutrient including energy, protein, fat, iron and calcium in the diet of adolescent girls were lower than RDA. The average daily intake was observed mean of energy (1960.20 ± 212.32), protein (33.45 ± 18.44) and fat (33.45 ± 18.44).

Conclusion

The studies concluded that early adolescent girls of Dantiwada taluka had poor nutritional status and Out of 300 respondents 84.70 per cent early adolescent girls were fall under < 19 category of BMI. Very high prevalence of malnourished was found in the early adolescent girls due to insufficient intake of food groups in their diet. Increase education and family income may help to improve health and nutritional status.

Suggestions

(1) Incorporate green leafy vegetable, milk, pulses *etc.* should be made in the daily diet of early adolescent girls

(2) Training programmed can be organized to demonstrate nutritive recipes for early adolescent girls

(3) Provide well-balanced diet rich in iron and vitamin 'C'

(4) To advised to use iron fortified salt, fortified cereals, *etc.*

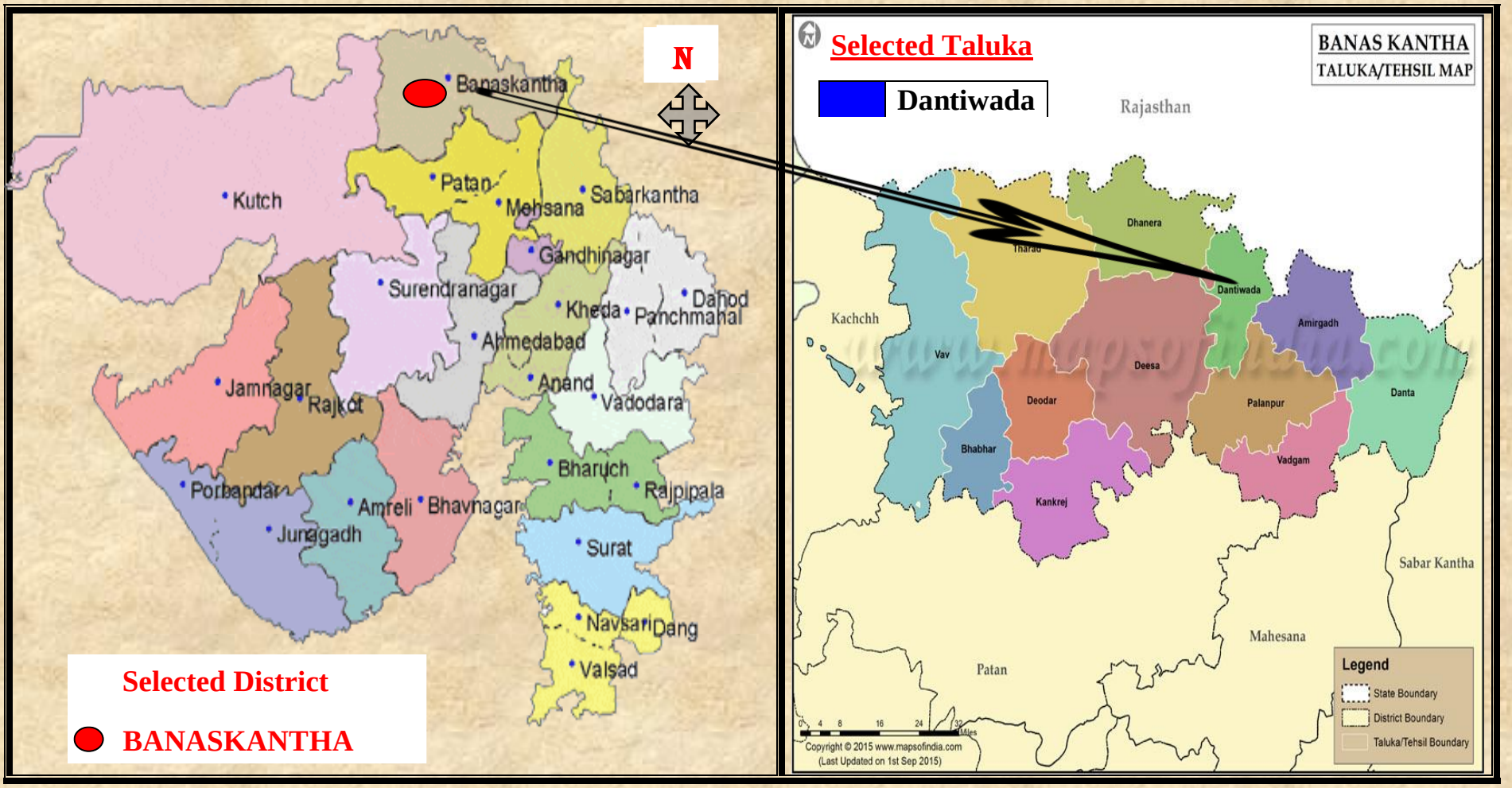
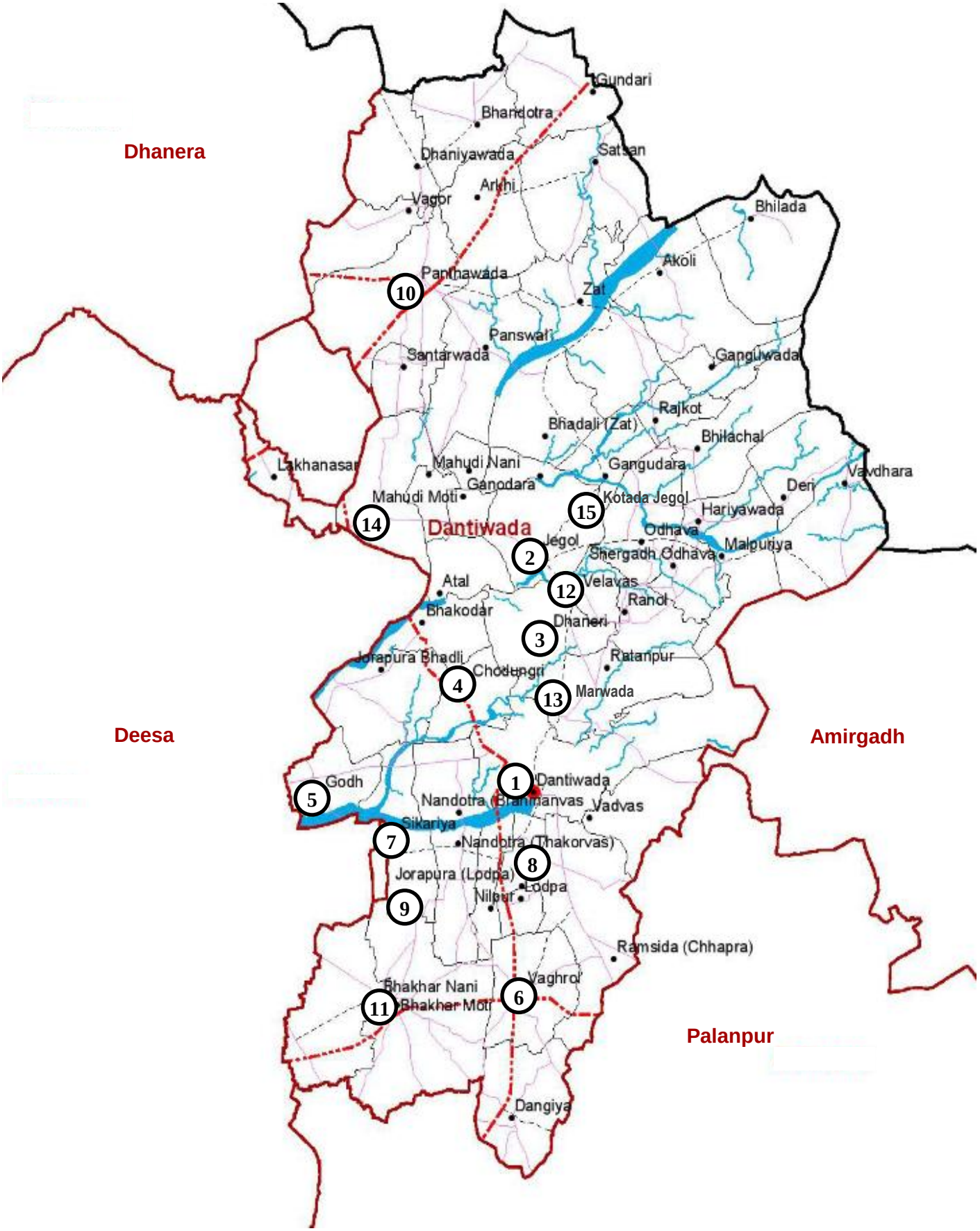
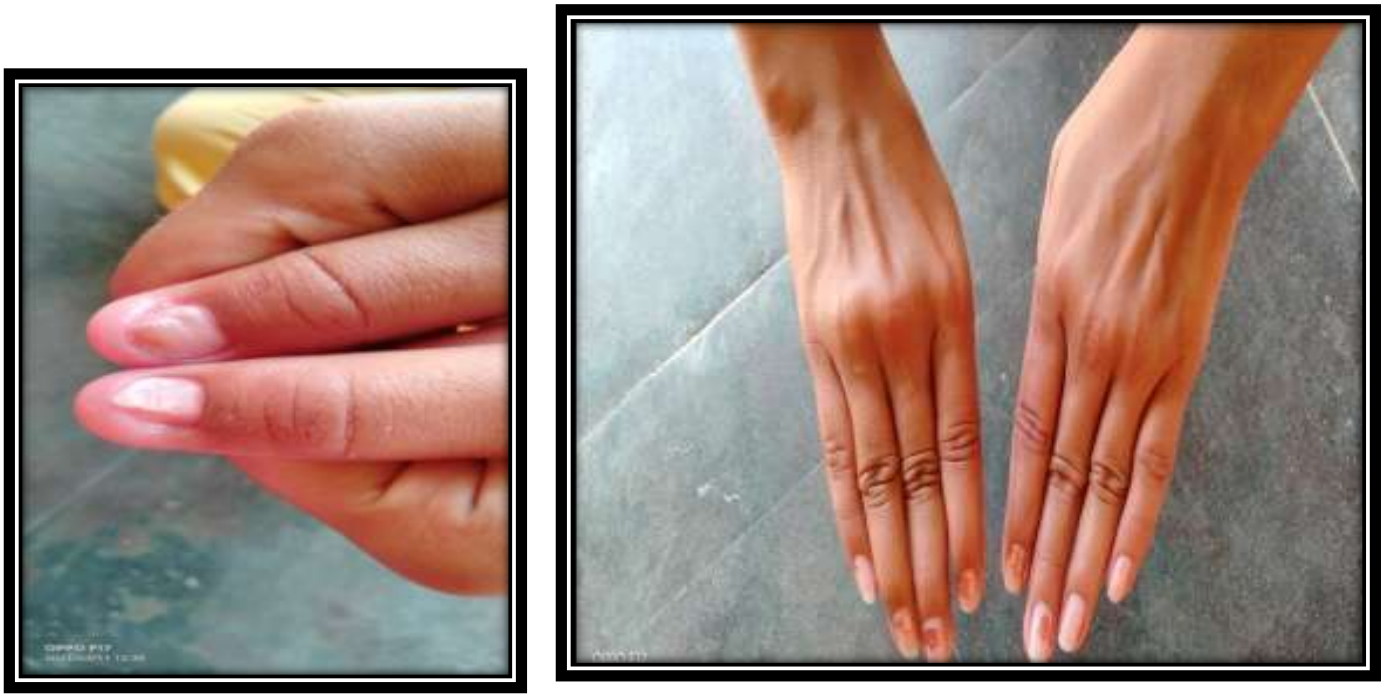


PLATE-1: MAP OF GUJARAT STATE SHOWING DANTIWADA TALUKA IN BANASKANTHA DISTRICT

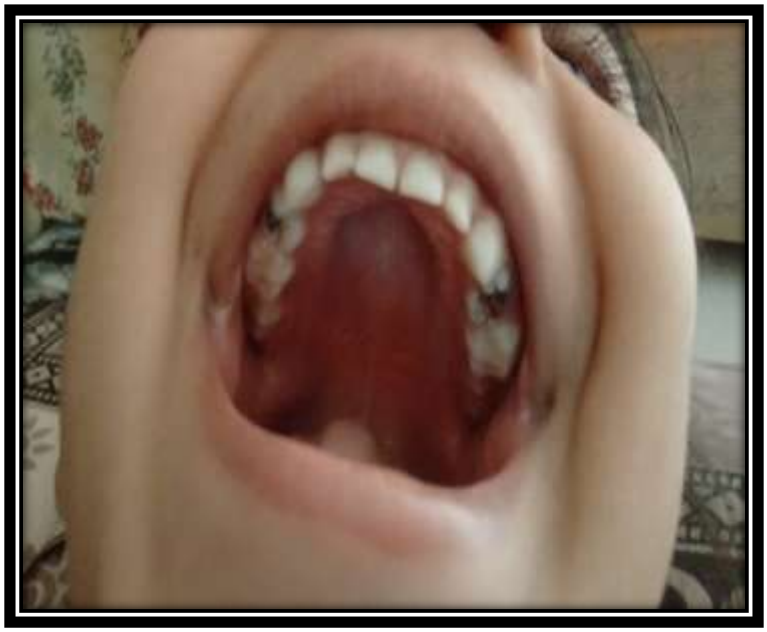

Dhanera
Deesa
Amirgadh
Palanpur
Dantiwada
Gundari
Bhandotra
Dhaniyawada
Satsan
Arlihi
Vagor
Bhilada
Akoli
Panthawada
Zat
Panswal
Santarwada
Gangiwada
Rajkot
Bhadali (Zat)
Bhilachal
Lakhanasar
Mahudi Nani
Gangudara
Vavdhara
Ganodara
Deri
Mahudi Moti
Kotada Jegol
Hariyawada
Odhava
Jegol
Malpuriya
Shergadh Odhava
Atal
Velavas
Ranol
Bhakodar
Dhaneri
Jorapura Bhadli
Ratanpur
Chodungri
Marwada
Godh
Dantiwada
Nandotra (Brahmanvas)
Vadvas
Sikariya
Nandotra (Thakorvas)
Jorapura (Lodpa)
Lodpa
Nilpur
Ramsida (Chhapra)
Vaghrol
Bhakhar Nani
Bhakher Moti
Dangiya
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15



Nail observation

Hair observation

Plate III (B) . Observation of clinical sign and symptoms in early adolescent girls



⇦ **Teeth observation**

Eye observation ⇨

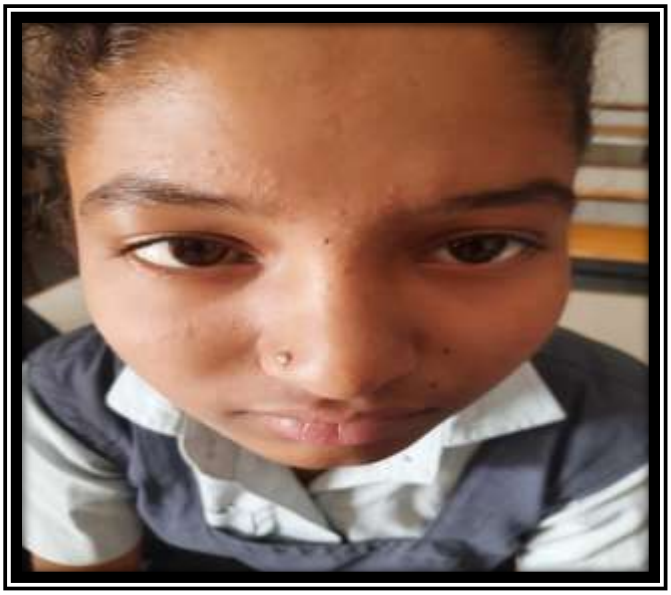


Plate III (A). Observation of clinical sign and symptoms in early adolescent girls

Weight measurement ⟹

⟸ **Height measurement**

Plate II.Anthropometric measurements of early adolescent school girls

Interview schedule

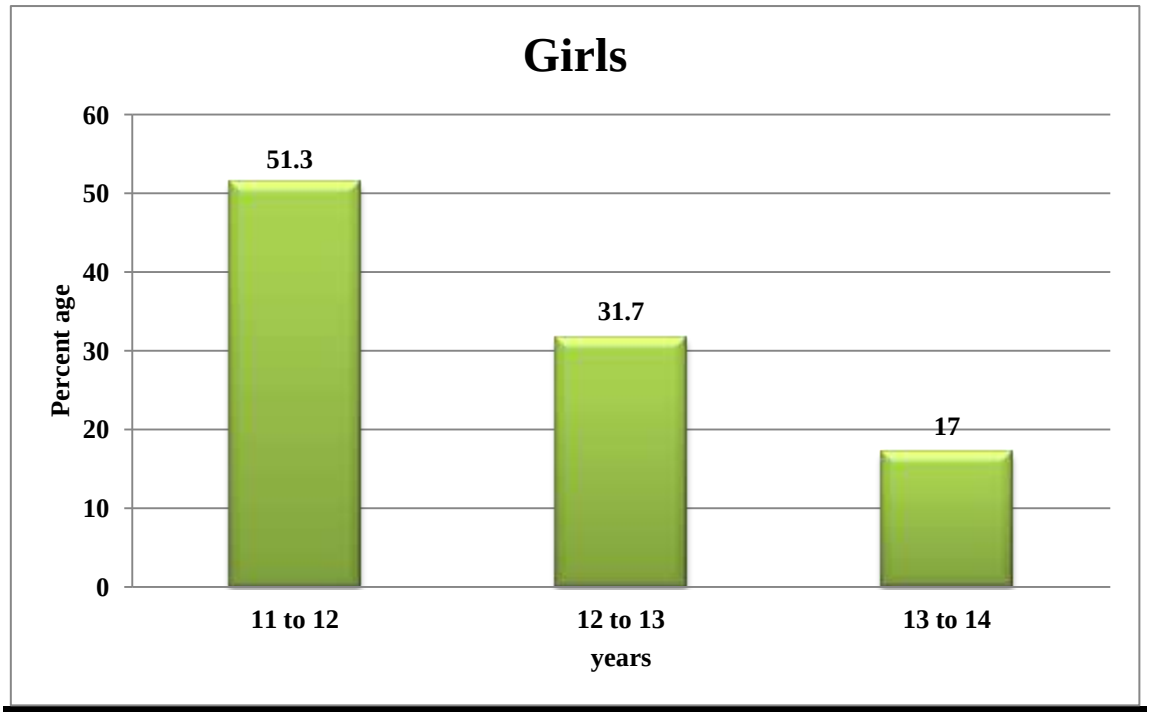


Fig 4.1. Distribution of respondents according to age

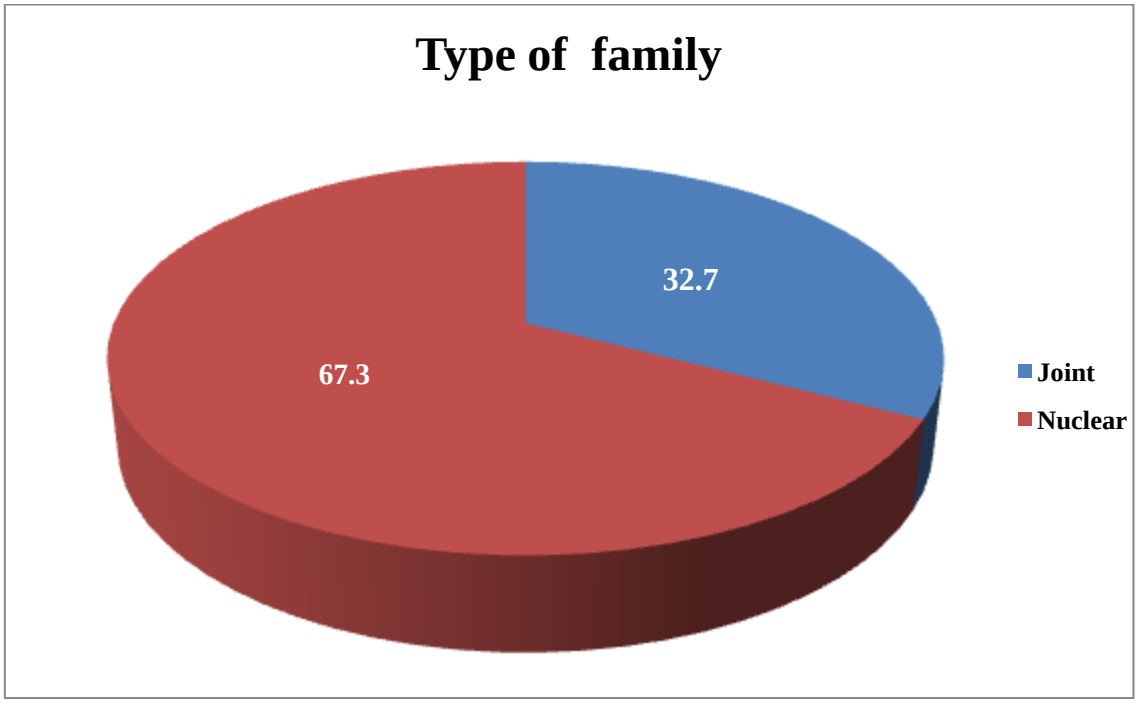


Fig. 4.2. Distribution of early adolescent girls according to type of family

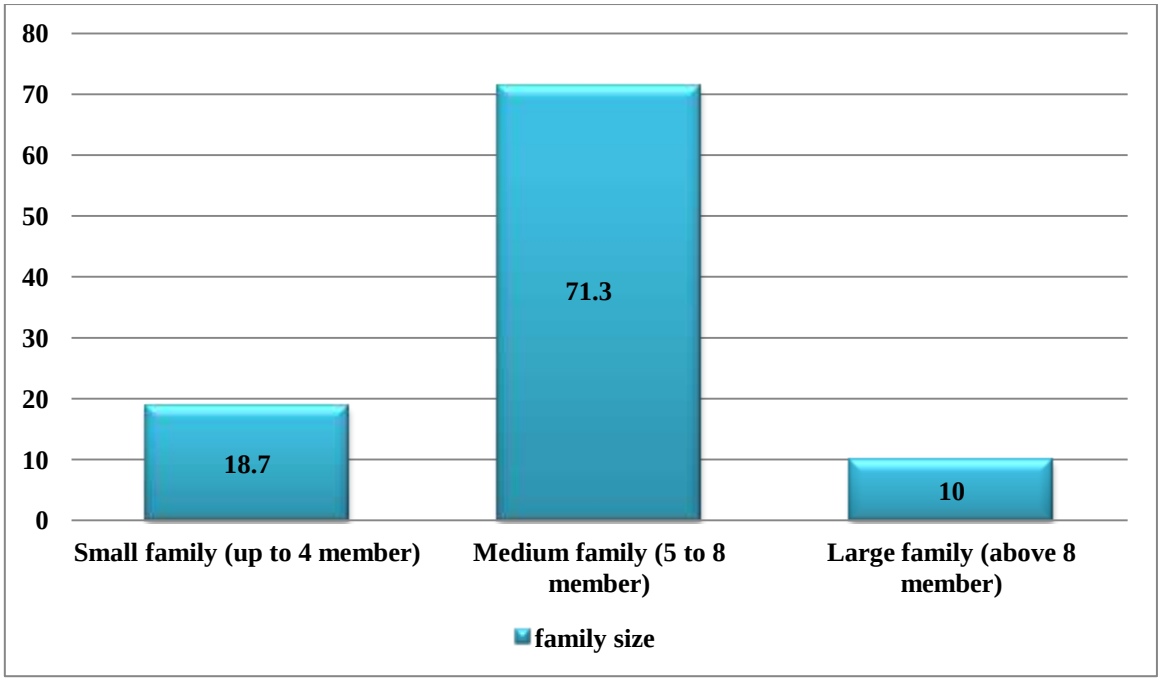


Fig. 4.3. Distribution of early adolescent girls according to family size

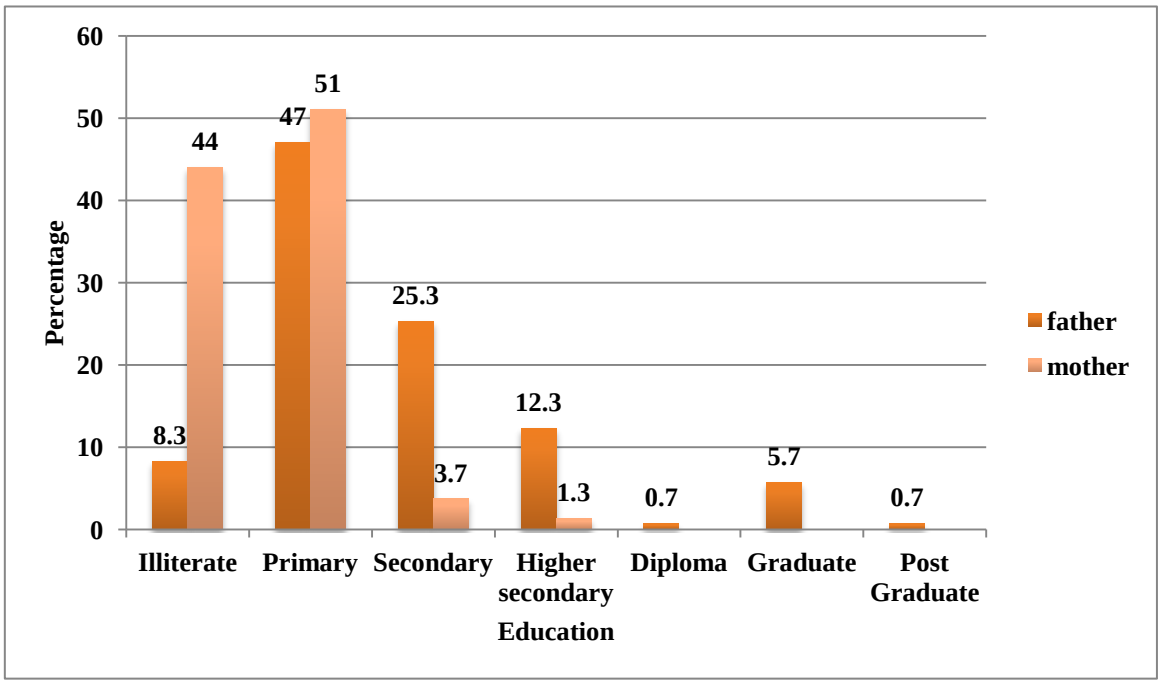


Fig 4.4. Distribution of respondents according to their father and mother level of education

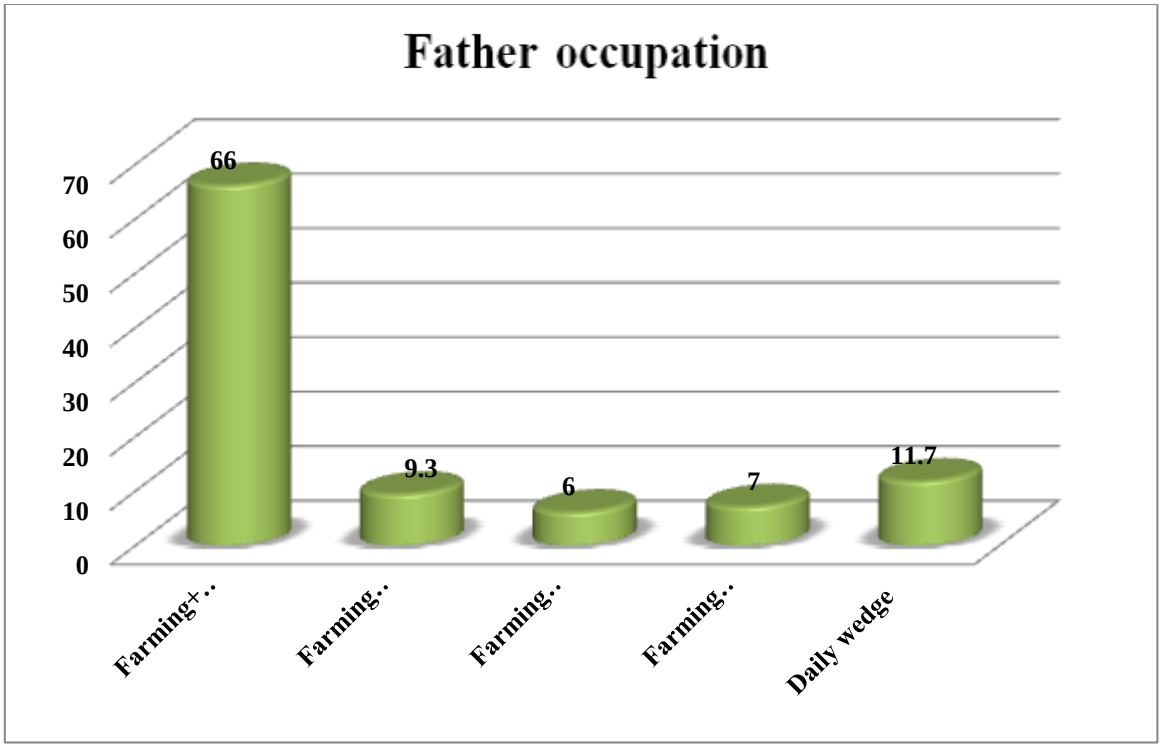


Fig. 4.5. Distribution of early adolescent girl's father's according to their occupation level

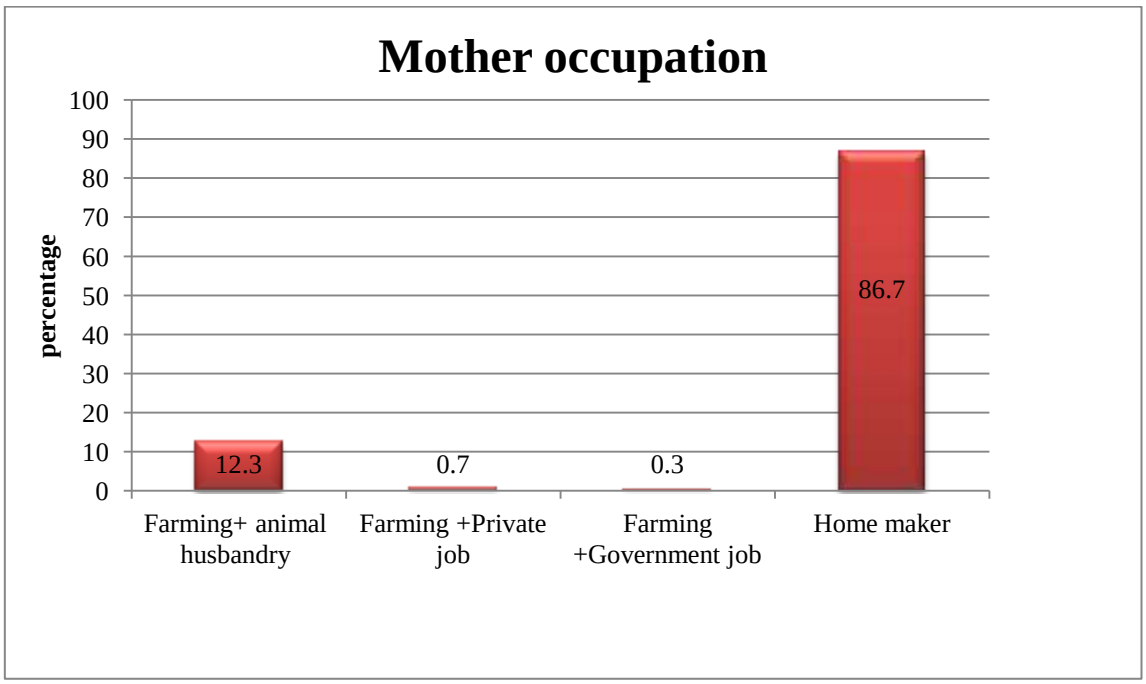


Fig. 4.6. Distribution of early adolescent girl's mother according to their occupation level

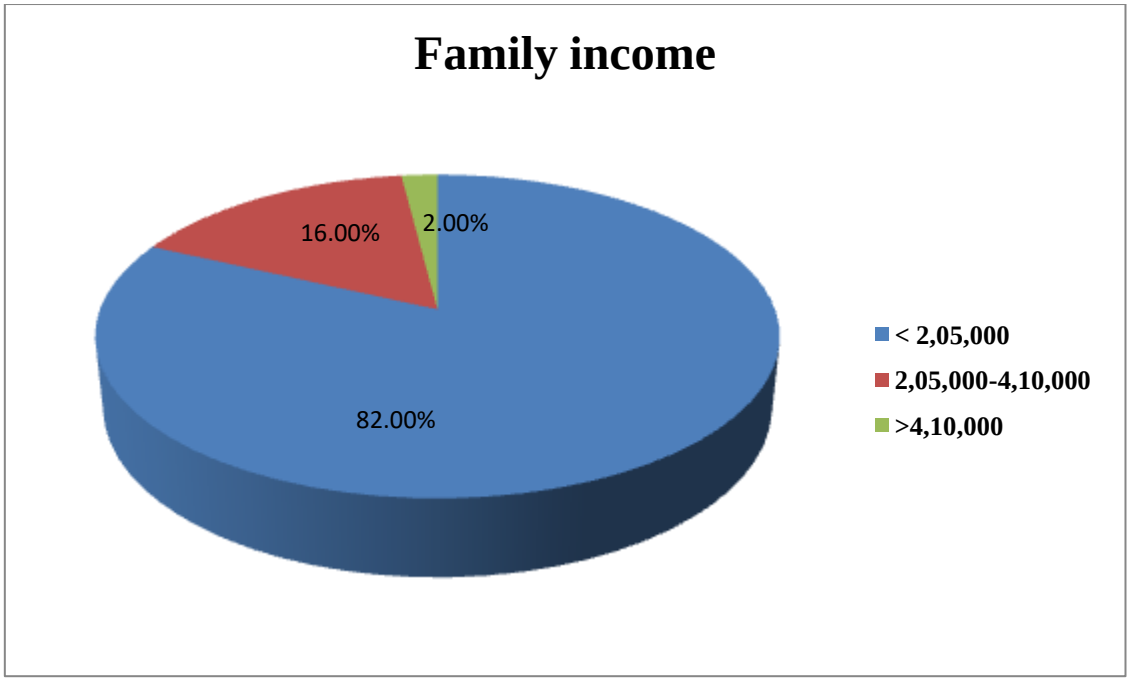


Fig. 4.7. Distribution of early adolescent girls according to family annual income

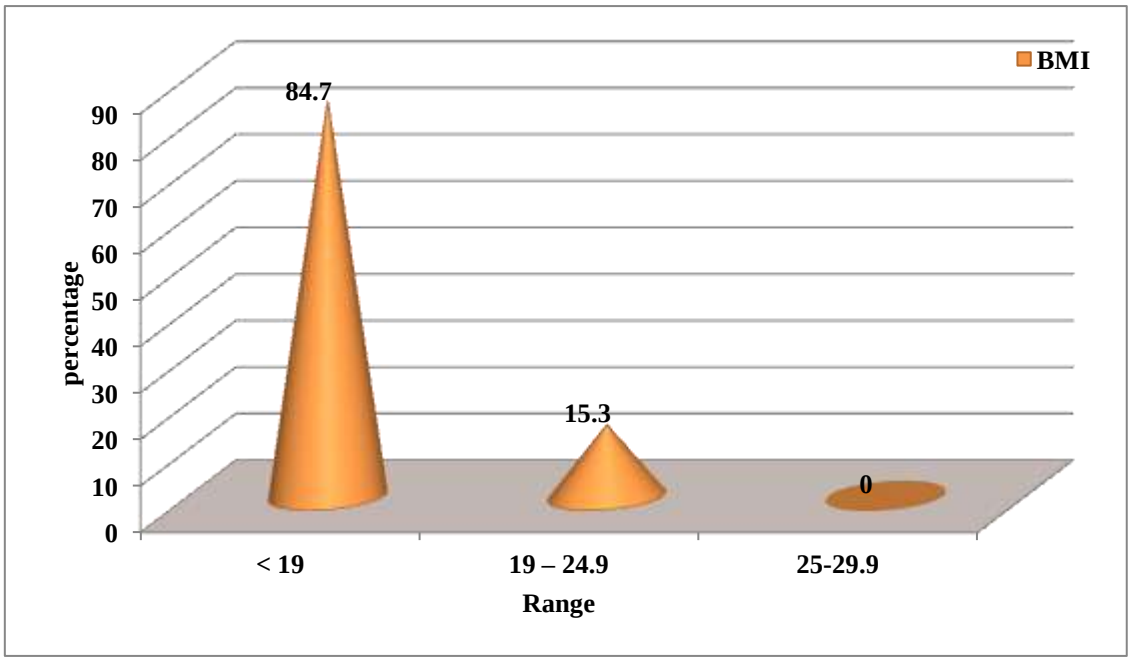


Fig. 4.8. Distribution of respondents according to BMI

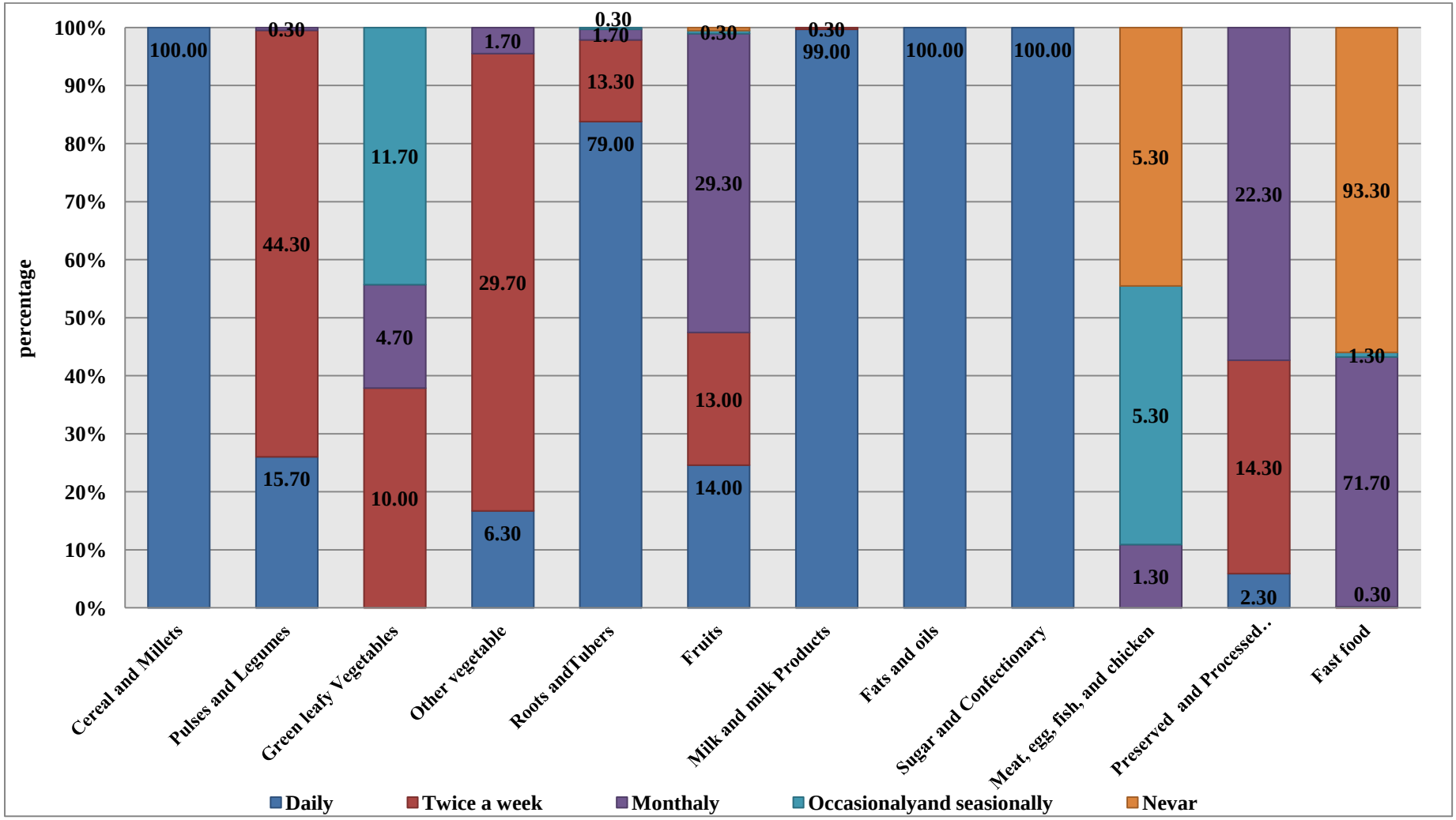


Fig. 4.9. Distribution of respondents according to food consumption pattern

APPENDIX-I

ASSESSMENT OF NUTRITIONAL STATUS OF EARLY ADOLESCENT SCHOOL GIRLS IN DANTIWADA TALUKA OF BANASKANTHA DISTRICT GUJARAT"

- ::: INTERVIEW SCHEDULE ::: -

BACKGROUND INFORMATION

Respondent No.: ☐ **Date: / /2022**

1. Name of the girl: _____
2. Name of School: _____
3. Address/House No: _____

PART – A

1. Personal and Socio- Economic Characteristics of the Respondents Parent:

1) Age of the girl : _____birth date : _____
2) Type of family: a) Joint b) Nuclear
3) Cast : a) General b) OBC c) SC d) ST
4) Number of siblings: 1 2 3 4
5) Types of house : Kutcha ___ Puccka _____
6) Family size:
   a) Small family (up to 4 member b) Medium family (5 to 8 members)
   c) Large family (Above 8 members)
7) Parents education level:

Education level	Father	Mother
a) Illiterate		
b) Primary		
c) Secondary		
d) Higher secondary		
e) Diploma		
f) Graduate		
g) Post Graduate		

Occupation of parents :

Parents	Occupation
Father	Farming+ Animal husbandry
	Farming+ Private job
	Farming +Government job
	Farming + Business
	Daily wedges

Mother	Farming+ Animal husbandry
	Farming +Private job
	Farming + Government job
	Farming + Business
	Home maker

8) Family annual income: ……..

PART- B

2. Anthropometric Measurements of pre Adolescents girl :

a) Height:_____ cm b) Weight:_____ kg

PART- C

3.Rapid Clinical Sign Examination for Nutritional Deficiency

1. Hair		**2. Face**	
Lack of luster		Diffuse depigmentation	
Thinness &sparseness		Naso-labial dyssebacea	
Easy pluck ability		Moon face	
Flag sing		Normal	
Normal		-	
3. Eye		**4. Mouth**	
Night blindness		Angular stomatitis	
Pale conjunctiva		Glositis	
Xerosis conjunctiva		Swollen bleeding gums	
Bitot's spots		Normal	
Normal		-	
5. Lips		**6. Tongue**	
Angular scars		Oedema	
Cheilosis		Magenta tongue	
Cleftlip		Glossitis	
Normal		Normal	
7. Teeth		**8. Gums**	
Molted enamel		Spongy bleeding gums	
Caries		Normal	
Normal		-	
9. Nails		**10. Skin**	
Brittle nails		Oedema bilateral	
Ridged nails		Follicular hyperkeratosis (type-1)	
Spoon Shape nails		Pellagrous dermatitis	
Normal		Normal	

PART-D

4. Diet survey of the Respondents

General pattern of dietary habits:

Type of food consumed:

(a) Vegetarian b) Non-vegetarian c) Lacto-ovo-vegetarian

Food consumption pattern of school going early adolescent girls :

Sr. No.	Number of the food products	Daily	Twice a week	Once a week	Monthly	Occasio-nally or season	Never
		(1)	(2)	(3)	(4)	(5)	(6)
Cereals :							
1.	Rice						
2.	Wheat						
3.	Bajra						
4.	Maize						
5.	Jowar						
Pulses and legumes :							
1.	Bengalgram (Whole)						
2.	Rajma						
3.	Lentil						
4.	Peas						
5.	Green gram						
6.	Soya bean						
7.	Bengalgram(Dal)						
8.	Blackgram (Dal)						
9.	Red gram (Dal)						
10.	Greengram (Dal)						
Green leafy vegetables :							
1.	Amaranth						
2.	Spinach						
3.	Fenugreek leaves						
4.	Drumstick leaves						
5.	Cabbage						
6.	Cauliflower (Green)						
7.	Coriander leaves						
8.	Radish leaves						
9.	Curry leaves						
Other vegetables :							
1.	Bottle gourd						
2.	Brinjal						
3.	Cauliflower						
4.	Cucumber						
5.	Ladies finger						
6.	Tomato						
7.	Cluster bean						
8.	Bitter gourd						
9.	Double bean						
10.	Ridge gourd						
11.	Kankoda						

Sr. No.	Number of the food products	Daily	Twice a week	Once a week	Monthly	Occasio-nally or season	Never
		(1)	(2)	(3)	(4)	(5)	(6)
Roots and Tubers :							
1.	Beet root						
2.	Carrot						
3.	Ginger						
4.	Onion						
5.	Potato						
6.	Radish						
7.	Sweet potato						
Fruits :							
1.	Amla						
2.	Apple						
3.	Banana						
4.	Dates						
5.	Grapes						
6.	Guava						
7.	Jamun						
8.	Lemon						
9.	Lime sweet						
10.	Mango						
11.	Orange						
12.	Watermelon						
13.	Pineapple						
14.	Pomegranate						
15.	Sapota						
Milk and milk product :							
1.	Milk (Whole)						
2.	Milk powder						
3.	Curd						
4.	Butter milk						
5.	Khoa (Mava)						
6.	Ice-cream						
7.	Milk sweets						
8.	Other milk product						
Fats and oils :							
1.	Butter						
2.	Dalda/Vegetable Ghee						
3.	Groundnut oil						
4.	Ghee						
5.	Other oils (Specify)						
Sugar and confectionary :							
1.	Refined sugar						
2.	Jaggery						
3.	Chocolates						
4.	Candy						
5.	Others						
Meat and meat products :							
1.	Egg						
2.	Fish						
3.	Chicken						

Sr. No.	Number of the food products	Daily	Twice a week	Once a week	Monthly	Occasio-nally or season	Never
		(1)	(2)	(3)	(4)	(5)	(6)
Preserved and processed foods :							
1.	Pickles						
2.	Papadis						
3.	Jams and Jellies						
4.	Other canned or						
5.	Bottle foods						
Fast foods :							
1.	Samosa						
2.	Pizza						
3.	Kachory						
4.	Sandwich						
5.	Vada pav						
6.	Dabeli						

24. hours dietary intake

Sr. No.	Timing		Food eaten	Household measures	Actual amount (g)	Size (Large/ Medium/Small)
			(1)	(2)	(3)	(4)
1.	**Early morning :**					
	(a)	**Tea :**				
		Whole milk				
		Skim milk				
		Water + Milk				
	(b)	Coffee				
	(c)	Lemon juice				
	(d)	Any other				
2.	**Breakfast :**					
	(a)	Bread butter				
	(b)	Khari				
	(c)	Chapatti				
	(d)	Bhakhri				
	(e)	Rotla				
	(f)	Milk				
	(g)	Pickles				
	(h)	Any other				
3.	**Mid-morning :**					
	(a)	Rice flake				
	(b)	Puffed rice				
	(c)	Fruit dish				
	(e)	Any other				
4.		**Noon :**				
	(a)	Chapatti / Rotla				
	(b)	Vegetables				
	(c)	Rice				
	(d)	Dal				
	(e)	Papad/ salad /Raita				
	(f)	Butter milk/ curd				
	(g)	Any other				

Sr. No.	Timing		Food eaten	Household measures	Actual amount (g)	Size (Large/ Medium/Small)
			(1)	(2)	(3)	(4)
5.	**Afternoon :**					
	(a)	Tea				
	(b)	Coffee				
	(c)	Biscuits				
	(d)	Any other				
6.	**Dinner :**					
	(a)	Bhakhri				
	(b)	Rotla				
	(c)	Vegetables				
	(d)	Khichdi				
	(e)	Curry				
	(f)	Salad				
	(g)	Milk				
	(h)	Any other				
7.	**Bed time :**					
	(a)	Milk				
	(c)	Any other				

REFERENCES

Andriastuti, M.; Ilmana, G.; Nawangwulan, S. and Kosasih, K. (2020). Prevalence of anemia and iron profile among children and adolescent with low socio-economic status. *International Journal of Paediatrics and Adolescent Medicine,* **7**: 88-92.

Asher, T.; Shobana, M.; Abarna, A.; Aamina, A.; Bharathi, B. and Chandy, P. (2020). The Prevalence of Anemia among the Adolescent Girls in a Selected College in Kanchipuram. *Medico-legal Update,* **20**(2): 29-32.

Baliga, S.; Naik, A. and Mallapur, M. (2014). Nutritional status of adolescent girls residing in rural area : A community-based cross-sectional study *Journal of the Scientific Society*, **41**(1): 22-25.

Bhandari, V. (2014). Nutritional Status, Dietary Practices and Nutrition Related Beliefs of High School Girls in Urban Area of Bangalore City. *Journal of Nursing and Health Science,* **3**(3): 1-6.

Bhargava, M.; Bhargava, A.; Ghate, S. and Rao, S. (2020). Nutritional status of Indian adolescents (15 to 19 years) from National Family Health Surveys 3 and 4 : Revised estimates using W.H.O., 2007. *Growth reference. PLOS One,* **15**(6): 0234570.

Chauhan, A.S.; Chauhan, S.R. and Bala, D.V. (2015). Anemia among Adolescent Girls and its socio-demographic Associates. *International Multispecialty Journal of Health,* **1**(9): 1-8.

Dayanand, S.; Pillai, M.; Arpita Dash, A.; Nanda, N.; Mallesh, K.; Deshwal, S.; Goel, S. and Shah, B. (2020). Nutritional assessment of early adolescents : cross sectional study from largest tertiary care centre of Gujarat. *Journal of Medical Science and Clinical Research,* **8**(1): 483-489.

De, K. (2016). Nutritional Status and Monarchical Age of Rural Adolescent Girls of Salboni Block of Paschim Medinipur, West Bengal, India, *Journal of Child Adolescent Behave,* **4**: p. 316.

Gadhavi , M.P. (2006). Study on food consumption pattern and nutritional status of tribal pregnant women of Danta taluka of Banaskantha District. M. Sc. (Home Science) Thesis, Submitted to Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar.

Garg, N. and Bhalla, M. (2016). To study the prevalence of anemia among school going children in rural area of Faridkot District, India. *International Journal of Contemporary Paediatrics*, **3**(1): 218-223.

Gasong, L.; Evy, D.; Marliyati, A. and Martianto, D. (2019). The relationship between nutritional status and nutrient intake with anemia incidence in adolescent girls. *International Journal of Pharmaceutical Sciences and Research,* **10**(9): 4251-4256.

Giri, M. (2022). Nutritional status assessment of rural adolescent girl child in Contai, Purba Medinipur, West Bengal. *International Journal of Creative Research Thoughts,* **10**(3): 2320-2882.

Gopalan, C.; Rama Sastri, B. V. and Blasubramanian, S. C. (2011). Nutritive Value of Indian Foods. *National Institute of Nutrition*, p. 98.

Goyal, N. and Rawat, C. (2018). A study of anemia and its correlates among adolescent girls in schools of Haldwani, India. *International Journal of Research in Medical Sciences,* **6**(10): 3320-3326.

Gupta, S. P. (1991). Statistical methods, Sultan Chand and son, New Delhi. *Indian Journal of Industrial Relations,* **27**: 150-201.

Hanan, S.; Gilani, A.H. and Haq, I.U. (2010). Anemia in adolescent college girls : effect of age, nutritional status and nutrient intake. *Pakistan Journal of Science*, **62**(4): pp.207-209.

Jelliffe, D.B. (1996). The assessment nutrition status of the community : World Health Organization Monograph Series No. 53 : WHO, Geneva.

Joshi, S.M.; Likhar, S.; Agarwal, S.S.; Mishra, M.K. and Shukla, U. (2014). A study of nutritional status of adolescent girls in rural area of Bhopal District. *National Journal Community,* **5**(2): 191-194.

Kaur, M.; Kaur, R. and Walia, P. (2020). Exploring Gender Disparity in Nutritional Status and Dietary Intake of Adolescents in Uttarkashi Indian. *Journal of Human Development,* **14**(1): 115-127.

Kayathri, A.; Mohan, A. and Indujamol, M. (2021). Nutritional Status and Body Image Satisfaction among Adolescent Girls. *International Journal of Research and Review,* **8**(10): 2454-2237.

Kishori, J. (2006). Editor. National Health Programs of India. 6th Edn. New Delhi : Century Publications; 2006. 82-84. *Allied Science*. **18**(2): p. 1.

Kollur, L.; Pratinidhi, A.K. and Kakade, S.V. (2014). Nutritional status of adolescent girls from a community in Maharashtra - a cross sectional study. *International Journal of Medical Science and Public Health,* **3**(8): 951-954.

Konwar, P.; Vyas, N.; Shah, H.; Gore, M. and Chaudhary, S. (2019). Nutritional Status of Adolescent Girls Belonging to the Tea Garden Estates of Sivas agar District, Assam, India. *Indian Journal of Community Medicine*, **44**(3): 238-242.

Kumar's, S. and Mishra, N. (2019). Nutritional Status and Dietary Pattern of Adolescent Girls : A Study From Urban Slums of Agra National. *Journal of Community Medicine,* **10**(6): 365-369.

Maiti, S.; Ali, K.M.; De, D.; Bera, T.K.; Ghosh, D. and Paul, S. (2011). A comparative study on nutritional status of urban and rural early adolescent school girls of West Bengal, India. *Journal of Nepal Pediatric Society,* **31**(3): 169-174.

Pandey, A. (2019). Nutritional status of rural adolescent school girls in District Raigarh, Chhattisgarh *International Journal of Recent Scientific Research,* **10**(2): 30931-30934.

Parimalavalli, R. (2012). Socio-Economic and Nutritional Status of the Tribal Children. *Study of Tribes Tribal's,* **10**(2): 183-187.

Patil, S.; Joglekar, C.; Desai, M.; Yadav, A.; Sonawane, S.; Chavan, R. and Mohite, R. (2018). Nutritional Status and Psychological Impairment in Rural Adolescent Girls : Pilot Data from "KOKAN" Region of Western India. Front. *Public Health,* **6**: p. 160.

Phuljhele, S.; Dewangan, S. and Anu (2021). Assessment of the nutritional status of adolescent girls aged between 15 to 18 years studying in government high school in Raipur, Chhattisgarh, India. Pediatric *Review. International Journal of Pediatric Research,* **8**(2): 100-108.

Ramamani, D. and Suganya, E. (2018). BMI and WHtR in assessing the nutritional status of adolescent girls. *International Journal of Contemporary Pediatrics,* **5**: 829-832.

Rani, D.; Singh, J.; Srivastava, M.; Verma, P.; Srivastava, D. and Singh, S.P. (2018). Assessment of Nutritional Status of Teenage Adolescent Girls in Urban Slum of Varanasi. *International Journal of Current Research Review*, **10**(20): 2231-2196.

Roy, A. and Gusain, P. (2019). A Study of Nutritional Awareness and Attitude of Adolescent Girls towards Nutrition. *Journal of Teacher Education and Research*. **14**(1): 1-3.

Saha, S.; Pandya, A.; Kandra,Y.; Raval, D. and Saxena, G. (2021). Cross-Sectional Analysis of Nutritional Status, Knowledge and Uptake of Nutritional Services Among Adolescent Girls in Western India Adolescent Health. *Medicine and Therapeutics,* **12**: 117-125.

Seva, S.; Lakshmi, K.; Lakshmi, J. and Gopal, V. (2021). A study on nutritional status of adolescent girls residing in professional college hostel. *The Pharma Innovation Journal,* **10**(6): 227-230.

Smitha, Malenahalli.; Chandrashekarappa.; Narayana, Murthy.; Mysuru, Ramakrishnaiah and Renuka, Manjunath (2018). Nutritional status in adolescent girls : Attempt to determine its prevalence and its association with socio-demographic variables. *Family Medicine and Community Health,* **6**(4): 184-190.

Soumyajit, M.; Chatterjee, K.; Kazi, A.M.; Devidas, G. and Shampad, A.P. (2011). Assessment of Nutritional status of Rural Early Adolescent School Girls in Dantan-II Block Paschim Medinipur District, West Bengal. *National Journal of Communicational Medicines,* **2(**1): 14-18.

Sridevi, R. (2016). A study to assess the knowledge regarding anemia among adolescent girls. *International Journal of Advanced Research,* **4**(11): 2272-2275.

Sridhar, D. and Gauthami, N. (2017). Nutritional status of adolescent tribal girls : A community based study. Medical Pulse. *International Journal of Community Medicine,* **4**(1): 1-4.

Srilakshmi, B. (2014). A textbook of Dietetics. Seventh Multi Color Edition. *New Age International Publishers* (Edn.). pp. 107-115.

Swetha, N.B.; Ranganath, T.S.; Nimra, S. and Ramya, M. S. (2017). Morbidity profile and its relationship with the nutritional status, among adolescent school girls Bangalore City : Cross-sectional study *International Journal of Medical Science and Public Health,* **6**(4): 4720-723.

Trivedi, P.K.; Saxena, D.; Puwar, T.; Yasobant, S.; Savaliya, S. and Fancy, M. (2016). Assessment of Nutritional Status of Adolescents : Field Experience from Rural Gujarat, India. *National Journal of Community Medicine*. **7**(12): 926-930.

Venkaiah, K.; Damayanti, K.; Nayak, M.U. and Vijayaraghavan, K. (2002). Diet and nutritional status of rural adolescents in India. *European Journal of Clinical science and Nutrition.* **56**(11): 1119-1125.

Venugopal, R.; Varoda, A. and Srivastava, P. (2016). Growth pattern and nutritional status of adolescent girls of Chhattisgarh. *International Journal of Current Science,* **8**(8): 36643-36647.

Virginia, D. and Fenty (2017). Correlation between Anthropometric measurements and risk of Anemia among rural community. *Journal FarmasiSains and Communities.* **14**(2): 112-119.

Wiafe, M.; Apprey, C. and Annan, R. (2020). Patterns of Dietary Iron Intake, Iron Status, and Predictors of Hemoglobin Levels among Early Adolescents in a Rural Ghanaian District. *Journal of Nutrition and Metabolism*. pp. 1-10.

World Health Organization (2019). https://www.who.int/data/gho/data/indicators/indicatordetails/GHO/prevalence-of.