Summary & Conclusions
Chapter-VI

SUMMARY, CONCLUSION AND RECOMMENDATIONS

The developments of a country are based on the development of adolescents of the country. The true development of the adolescents is possible only when they are healthy. Health of a person is decided by his/her nutritional status.

The protein intake of girls of both the groups was below than (ICMR) RDA. But in case of fats and carbohydrate the mean intake were more than (ICMR) RDA for both the group of girls.

Carbohydrate intake is found significantly different i.e. 299.6 g and 270 g for WW and NWW boys respectively. The mean protein intake of body the groups of boys was below than (ICMR) RDA while the fat and carbohydrate intake was found more than (ICMR) RDA.

At the time of independence maternal and childhood mortality was as peak. Country was compounded with illiteracy, poverty and resources were meagre. During first developmental plan priority was accorded to MCH services and in spite of all odds, success has been achieved in bringing down mortality indicators. Emphasis had been put on raiding nutritional status of under five children through a number of initiatives including integrated child development scheme. However, benefits of various nutrition programmes have not been so profound particularly in case of girls child.

It is now realized that nutritional insult at earlier ages leaves their mark during adolescence. Besides this, this in adolescent girls psychological and emotional problems are of considerable magnitude and they may exert
significant influence on their nutritional status. Although, genetics codes set the upper limit of optimum growth, the environment in which they thrive can help or hinder realization of that goal. During adolescence, gender based discrimination prevails in various ways viz., selective nutritional neglect of girls, differential investment or expenditure on health care educational opportunities and work force participation. Unfortunately assessment of nutritional status of adolescent girls has been the least explored area of research particularly in rural India.

Clinical examination has always been, and remains an important practical method for assessing the nutritional status of a community. Nutritional anaemia has been considered as an important problems in adolescent girls. Clinically one out of four adolescent girls suffered from nutritional anthropometry predominates over the other methods of nutritional assessment. This situation is serious with respect to the findings of present study. However, comparatively low figure has been reported by other research. The maximum under nutrition observed on the basis of mid arm circumferences and weight for age at different age points is in close agreement at early adolescent age. Which indicate that adolescent girls are the worst suffers of the ravages of various forms of malnutrition since the beginning of adolescent periods. This phenomenon remains uninterrupted throughout their life. This is substantiated by the fact that in this study stunting which is considered as index of chronic or long duration of malnutrition was maximally present during middle and late adolescence. Besides clinical examination and nutritional anthropometry, hemoglobin (Hb) estimation is an important component of nutritional assessment. Nutritional anaemia even if it is prevalent in adolescent girls its proper assessment needs Hb estimation and study of biochemical parameters. Perceptive difference has not been observed in the extent of anaemia by clinical observation and haemoglobin estimation,
thereby indicating applicability of clinical examination for detecting anaemia in adolescent girls.

The poor nutritional status of adolescents specially girls, has important implications in terms of physical work capacity and adverse reproductive outcomes. However, much more needs to be done to address the issue of adolescent malnutrition at the national level.

Anthropometrics can be sensitive indicators of health, growth and development in infants and children. Malnutrition (under nutrition or over nutrition) which refers to an impairment of health either from a deficiency or excess or imbalance of nutrients all over the world. It has now been well established that the body mass index (BMI) is the most appropriate variable for determining nutritional status among adolescents.

Adolescence is a period of increased nutritional requirements and adolescent anthropometry varies significantly. Therefore, there is a need to develop a data base of adolescent under nutrition from different parts of the country.

50.0 per cent boys were belong to between age group 15 to 16 years and 32.1 per cent boys were between 13 to 14 years age group. 53.7 per cent girls were belonged to age group 15 to 16 years while 34.1 per cent in 13 to 14 years. This was determined from the register of the school. The school insists on a birth certificate at the time of admission and thereafter the age is increased by one every year. Only those children who were listed in the register to be in the age group of 12 to 18 years were included in this study.

50.0 per cent girls were having high school whereas 36.6 per cent educated upto 9th level. 48.8 per cent overall respondents were educated upto high school whereas 35.6 per cent were educated upto 9th level.
51.3 per cent girls and 48.7 per cent boys were taken in this study.

43.6 per cent boys were of upper caste and 33.3 per cent boy’s were of OBC caste. Fifty per cent girls respondents were belonged to upper caste while 34.1 per cent girls respondents were belonged to OBC caste.

39.7 per cent boys whose mother were educated upto high school whereas 28.2 per cent boys whose mother were educated upto intermediate, 43.9 per cent girls whose mother educated upto high school and 15.9 per cent girls whose mothers educated upto graduate and above.

51.3 per cent boys were belonged to Hindu religion whereas 30.8 per cent Muslim religion, 47.6 per cent girls were belonged to Hindu religion whereas 31.7 per cent Muslim religion.

58.5 per cent girls mother were housewife whereas 30.5 per cent girls mothers were in service class. 66.7 per cent boys fathers were doing service while 73.2 per cent girls father.

65.4 per cent boys have 4 to 5 members family size whereas 20.5 per cent upto 3 members. 70.7 per cent girls were from 4 to 5 members family size.

52.4 per cent girls family earned upto Rs. 10,000 monthly whereas 42.7 per cent girls family earned Rs. 10,000 to Rs. 20,000 monthly.

55.9 per cent girls mother were earning upto Rs. 5000 monthly whereas 38.2 per cent girls mother’s were earning Rs. 5000 to Rs. 10,000 monthly. Only 5.9 per cent girls mothers were earning Rs. 10,000 and above monthly.

24.4 per cent working women girls vegetarian. 25.6 per cent boys of non-working women were non vegetarian whereas 30.8 per cent boys of non working women were vegetarian.

The mean height and weight of girls of working women were 151.48 cms and 42.69 kg respectively which were near about the same as mean height and
weight of girls of non working women i.e. 151.11 cm and 42.21 kg respectively. Height in centimeters was marked on a wall in the school with the help of a measuring tape. All children were measured against the wall. The children were asked to remove the foot wear, and stand with heads together and head positioned so that the line of vision was perpendicular to the body. A glass scale was brought down to the topmost point on the head. Height was recorded to the nearest 1 cm. A bath room scales was used. It was calibrated against known weights regularly. Zero error was checked for the removed if present every day clothes were not removed as adequate privacy was not available. However, as the study period was in September, when the weather was warm, only light clothes were worn by the students. Weight was recorded to the nearest 500 grams.

The mean height of boys of working women was 162.45 cms which was near about the some 161.21 cm for boys of non working women. There was significant difference in weight of boys of working women and non working women, which was 51.02 kg and 48.99 kg respectively.

Mean body mass index of working women boys were more than non working women boys and mean body mass index of working women girls slightly lower than non working women girls. There was non significant difference between body mass index of girls of working women and non working women.

Body mass index of working women girls were maximum in age group 17 to 18 years (18.69 kg/m², ± 1.38). There was positive linear increasing trend in mean height and weight for girls between 13 to 18 years age group. Mean BMI increased progressively in working women between 13 to 18 years age groups.
Mean BMI increased progressively in working women boys and non working women boys according to age group 13 to 18 years (18.81 kg/m², ± 1.89) respectively. Mean body mass index of working women boys were slightly higher than non working women boys.

There was non significant difference in Hb level of WW and NWW girls which is below the respective standard. In boys there was significant difference between working women boys and non working women boys haemoglobin (Hb) estimation is an important component of nutritional assessment. Nutritional anaemia even if it was prevalent in adolescent girls its proper assessment needs Hb estimation and study of biochemical parameters.

Left mid arm circumferences and head circumferences of working women girls were similar to non working women girls. The observed value of ‘t’ was non significant in left mid arm circumference, head circumferences of working women girls and non working women girls.

The mean haemoglobin was higher in working women, girls age compared to non working women girls age group 13 to 18 years.

Age group 13 to 18 years haemoglobin level of working women and non working women girls were slightly increased. Mean Hb in 17 to 18 years of girls respondents 12.62 g/dl. Average haemoglobin of menstruating girls (8.98 ± 2.1 g/dl) was lower than age of 17 to 18 year girls.

Calories, protein, carbohydrates and vitamin A were significant difference of working women boys and non working women boys. Protein were required for maintenance in adolescents for growth in infants and children. The relative requirement of proteins of the latter groups are higher than in adults. Fat is an important component of diet and service a number of functions in the body. Fat
is a concentrated service of energy and it supplies per unit weight more than twice the energy furnished by either protein or carbohydrates.

Energy, protein, fat, calcium, iron, vitamin A and vitamin B carotene nutrient were lower in girls and boys from recommended dietary allowances. Adolescents need a wide range of nutrients to perform various functions in the body and to lead a healthy life. The nutrients include proteins, fat and carbohydrate, vitamin and minerals. Protein, fat, carbohydrate are sometimes referred to as proximate principles. They were oxidized in the body to yield energy which the body needs. Although proteins provides energy, their primary function is to provides amino acid for building body proteins. Fat particularly the vegetable oils, besides being a concentrated sources of energy, provides essential fatty acids which have a vitamin like function in the body.

The adolescent nutrients intake much higher than other lower income group of working mother’s nutrients calories proteins, fat, carbohydrates, iron, vitamin A and calcium were higher in Rs. 5000 – Rs. 10,000 income and Rs. 10,000 and above in both sex. Adolescents is a transition stage in life cycle, linking childhood to adulthood.

Mother’s educations were play important role in adolescent life physical and mental fitness. Mother is the first teacher in all activities in children life. Nutrients intake calories, protein, fat, carbohydrates, iron, vitamin A and calcium were higher in adolescents of higher mother’s education. The poor nutritional status of adolescents specially girls, has important implications in term of physical work capacity and adverse respective outcome.

Adolescents were randomly selected from four different colleges, of Hamirpur district one private and three government colleges. Adolescent of higher income group families were reading in private college so nutrition level
of adolescent was better than other government Inter colleges. Families belong to higher income group given good diet to their children.

26.9 per cent boys of working women were normal belong to 15 to 16 years age group whereas 21.9 per cent girls of working women were belonged 15 to 16 years age group of normal position. 29.3 per cent girls of non working women were under nutrition were as 20.5 boys, 19.5 per cent girls of non working women of age group 13 to 14 years age group were observed under nutrition.

**Research Methodology**

The study was conducted in Hamirpur district. Four colleges (3 govt. Colleges and one private college) were selected in the study area boys and girls both selected. 40 students were selected from each college working and non working women. Thus, 160 respondents were purposively selected in the study area. Dependent and independent variables were used such as age caste education, income and anthropometric measurement, height, weight, BMI, haemoglobin, anaemia status, food requirement energy protein, fat, calcium, thiamine, nicotinic acid, ascorbic acid and carbohydrate. The statistical tools were used $\chi^2$, $t^2$, S.D. mean.

**Suggestion, Recommendation and Policy Implications**

1. To screen adolescents for severe under nutrition to determine the need for admission to therapeutic feeding:

   Use clinical criteria, visual evidence of extreme emaciation can identify those walk for work may also be important in identifying those in greatest need. Pregnant and lactating adolescents may need additional nutritional support.
2. To screen adolescents in less extreme need of nutritional interventions:

   Use BMI for age to assess acute under nutrition. Each measured adolescent’s BMI is compared to members of the same age and sex in the National Center for Health Statistics (NCHS) reference population consisting of adolescents in the United States who were measured as a part of the first National Health and Nutritional Examination Survey (NHANES) in 1971-1974. 24, 25 [Note that CDC has recently published new growth charts based on children from the U.S.].

   Adolescents falling below the 5th centile of the NCHS reference population may need intervention, although local cut-offs can also be developed which take into account the availability of resources to manage the patient load.

   Because of major difference between boys and girls in the timing of maturational events (including the growth spurt). Separate references must be used for each sex.

3. To estimate the prevalence of acute under nutrition in a population of adolescents:

   Use BMI for age as described above. Calculate proportion of adolescents falling below the 5th centile or a locally defined cut-off point.

4. To estimate the prevalence of chronic under nutrition in a population of adolescents:

   Compare the height of each adolescent to the height of adolescent of the same sex and age in the NCHS reference
population. Adolescent falling below the 3rd centile of the NCHS reference population.

5. In addition, WHO recommendations describe a method to adult, at least in part, for potential difference in the ages of maturation between survey populations and the reference population. This adjustment can be undertaken when assessing either acute or chronic under nutrition.

Along with weight, height, and survey worker should collect data on specific landmarks of sexual maturations. For each female adolescent, the tanner breast stage and the age of menarche (if post menarchial) should be collected. For male adolescents, the tanner genifalia stage and the age of attainment of adult voice should be collected. For female adolescent, investigators than the difference is calculated between the survey population and the reference population in the median ages of attaining these landmarks. For each sex, the differences for the two landmarks are averaged.

For each separately, the average difference between the survey and reference populations in these median ages is than used to adjust the age of each survey subject.

**Future Research Needs**

**Anthropometrics index**

The association of various indices, such as weight for height, BMI, and Rohrer index, with age and height should be further explored in adolescents. Such exploration should include analysis of existing data from past surveys that measured weight, height, MUAC, and age of adolescents. Re-analysis using data
from populations with a variety of health conditions and various degrees of under nutrition could be undertaken. In addition to investigating the association between anthropometrics indices and age and height, future analyses of survey data could include estimates of the error induced in the estimated prevalence of under nutrition by various degree of uncertainty about age. The index chosen should be the least dependent on age in order to minimize the effect of using in accurate ages.

Defining functional cut-offs

Longitudinal studies are required to determine whether adolescents falling below specific cut-off points of weight for height, BMI, and Rohrer Index have elevated morbidity or mortality, poor pregnancy outcome, suppressed growth, or decreased work ability or physical performance measures. These studies should be conducted in a variety of situations among adolescents among adolescents with different levels of under nutrition.

Practically of measurements and calculations

The practically of obtaining various should be explored in field situations. Survey organizer should assess the case of training survey workers in measuring MUAC, weight, and height, as well as assessing inter-observer variability when measuring adolescents.

Markers of Pubertal development

The accuracy of self reported tanner stage for breast and genital development among female and male adolescent needs to be tested in a variety of populations. For example, adolescents self-assessment upon viewing drawing or photographs of different tanner stages could be compared to finding of physical examinations. Studies could also explore the use of other markers of sexual development such as the extent of axillary hair. Moreover, the age at
which various landmarks of sexual development are achieved should be described in many different populations both normally nourished and under nourished, in order to determine which marks can be used for adjusting for different developmental age between survey and reference population.

**Adjusting for difference in body shape**

Survey should explore the utility of adjusting anthropometric indices for difference in body shape by using the ceramic index or other indicators of body shape in distinct population.

**Vulnerability**

More nutrition surveys should include assessments of the nutritional status of different age group to determine the relative vulnerability of young children, adolescents, women of child-bearing age, elderly, and other population subgroups in different types of humanitarian emergencies.

**Use of anthropometry at all**

Other measures, such as strength or other functional outcomes, may better reflect an individual's risk of nutrition-related morbidity or mortality and should be explored as indicators of adolescent nutritional status.

**Screening for severe under nutrition**

Until better method can be developed and validated, screening for severe under nutrition in order to determine the need for therapeutic feeding should use clinical criteria as recommended for adults.

**Correlation for differences in age of sexual maturation**

Some measure of the age of specific Rubertal landmarks should be measured during nutrition surveys of adolescents. Measure that may be useful include age of Menarche in females. Unfortunately, validated markers that are
practical for field use do not exist for males. Correlation for differences between
the survey population and the reference population should be undertaken if the
necessary data are available for the reference populations used.

**Pubertal adolescents**

Because young adolescents may be more similar to children, the most
appropriate index for use in measuring under nutrition. Prevalence among
prepubertal adolescents may be weight for height at least until other indices are
more fully investigated. Individual can be compared to an existing reference
using the preliminary weight for height tables in Annex 1. Data from this
original reference population should be recalculated to provide direct weight for
height cut-off points.

**Post Pubertal adolescents**

Because older adolescents may be more similar to adults, BMI should be
used until other indices have been more fully investigated. Nonetheless some
linear growth continues and BMI continues to change with age after attaining
sexually maturity. As a results, cut-off points should be age-specific. Although
several reference population exist for which BMI centiles and/or Z-scores have
been calculated, the international reference population described by cole 80 may
be the best reference currently available for use in the developing world. The
method for creating age-specific cut-off points described by cole should be used
to determine cut-off points, in both per cent of median and Z scores,
corresponding to the adult BMI cut-off points of 16, 17 and 18.5 kg/m-2.