Adolescent girls often lack in elementary health and nutrition information, and they have poor or less nutritional knowledge and awareness towards health and associated problems. These nutritional problems make them feel tired, irritable and unable to concentrate resulting in diminished learning capacity. However, they have a positive inclination to acquire more knowledge about nutrition education. Effective communication and nutrition education can play a significant role to enhance their nutritional awareness and good health; keeping this in view, the present work entitled “Nutritional Status and Eating Behavior of Adolescent Girls on Intervention with Nutrition Education in District Kurukshetra” was conducted on rural and urban adolescent females.

From the rural and urban area of district Kurukshetra, 200 adolescent females were selected for the experimental plan. According to age, these 200 girls were classified into early (13-15 years) and late (16-18 years) adolescence period with 120 and 80 numbers of subjects respectively. These girls of each age group were again sub-grouped into two categories according to their residential area i.e. rural and urban area and further, the subjects of each area were sub-grouped into four experimental groups; Group acquiring Nutrition Education through Audio Aids alone (GNEAA), Group acquiring Nutrition Education through Visual Aids alone (GNEVA), Group acquiring Nutrition Education through Audio-Visual Aids (GNEAVA) and the fourth group served as No Education (NE) group to whom no education was imparted. Each experimental group was having fifteen subjects in early and ten subjects in late adolescence period.

Personal and family background, medical history, dietary pattern and outdoor eating habits, the level of nutritional knowledge, awareness about health, common misconceptions about foods and attitude towards nutrition and health of the selected subjects was recorded on a self-structured and pre-tested questionnaire before starting the experimental trial. Nutrients (calories, proteins and iron) intake of the subjects was collected and composed by using 24-hour recall method for three consecutive days before and after the experimental trial. Anthropometric measurements (height, weight, mid-upper arm circumference, calf circumference and chest circumference normal and
expanded positions) of each subject was recorded. Haemoglobin, total iron binding capacity (TIBC) and serum iron values were measured before and after imparting nutrition education to these subjects. To observe the change in the behaviour of these adolescent subjects; self-confidence, study habits and self-expression at home and school were assessed before and after imparting nutrition education. In addition, special counselling sessions were arranged for subjects and for their parents.

The salient highlights of the research are being summarized below:

Maximum subjects of early (71.1%) and late (83.3%) adolescence period from urban area belonged to nuclear families. The trend of joint families (57.8%) was observed maximum in early adolescent subjects followed by (50%) in late adolescent subjects from rural area. Eighty-two percent of the total subjects in early and late adolescent period were from Hindu community. Sikh community comprised of 13.3% of total subjects, whereas Muslim girls constituted only 0.7%. Among all the selected subjects, nearly 31.3% of fathers were matriculate, 28.7% were 10+2 pass-outs, 13.3% were graduates and only 8% were postgraduates. The majority of fathers of subjects of early (55.6%) and late (46.7%) adolescence period from rural area were engaged as laborers in agricultural lands because of their low educational status. While fathers of the subjects in early and late adolescence period belonging to an urban area had their own business and the respective figures were 53.3 and 56.7 percent. Similarly, 24 percent mothers of all selected subjects from rural and urban area were illiterate. In rural area, 24.4 percent mothers of early adolescent subjects were illiterate, however, this figure was found 30 percent in the case of mothers of late adolescent girls. Whereas, the corresponding figures for the mothers of subjects in urban area were 22.2 and 20 percent, respectively. Maximum (58.7%) mothers of all selected subjects were homemakers. Around forty-one percent mothers of early and late adolescent subjects belonging to the urban area were working as maid servants, whereas, this figure was 16 percent in mothers of subjects from a rural area.

Data of the hereditary problems revealed that parents of the subjects from rural area had less genetic problems than the parents of the subjects belonging to the urban area. In early and late adolescence groups of both the areas, the incidence of diabetes, high and low BP as well as obesity were recorded maximum in parents of the subjects belonging
to the urban area. However, the occurrence of diabetes and obesity was recorded in six percent mothers, whereas among fathers; high blood pressure (10%), diabetes (8.7%) and obesity (6.7%) was observed, irrespective of age and areas.

The highest number of girls (47.3%) had a tendency of frequently falling sick and out of these, 67.3 percent were taking allopathic medicine. Subjects from an urban area in early (31.1%) and late (36.7%) adolescence period were more inclined towards homeopathic medicines.

In early adolescence period, four girls (8.8%) belonging to a rural area and six girls (13.3%) belonging to the urban area had weakness in eyes and only one girl from rural area was affected with asthma. The menstrual cycle had not started in 50 percent subjects from a rural area in early adolescence period. Rest of the girls who had attained menstruation had mostly four days’ cycle.

Maximum girls from both areas rural and urban areas in early and late adolescence period were consuming vegetarian diets regularly in their meals. Even if they were non-vegetarian, they used to eat vegetarian meals daily. Among all subjects in both the age groups, maximum (46.6%) subjects were observed to be ovatarians followed by vegetarians (38%) and only 15 percent of the subjects were found to be non-vegetarians. The figures for ovatarians changed from 46.7 to 51.1 percent and from 51.1 to 55.6 percent in subjects of early adolescence belonging to the rural and urban area. Similarly, in late adolescence group, number of ovatarian girls were more than vegetarians and non-vegetarians, but these numbers changed from 16.7 to 23.3 % and 20 to 26.7% in non-vegetarian and from 43.3 to 50 % and 46.7 to 53.3% in ovatarian girls belonging to rural and urban area. It is observed that mostly girls belonging to rural and urban area consumed eggs only in baked products, whereas, a few had it in boiled form and some girls had omelettes and egg bhurgi. The trend for packed lunch was not common in the subjects of both age groups belonging to urban area because of availability of canteens in their schools. After imparting nutrition education, subjects belonging to the urban area who did not take packed lunch with them also started to take tiffin with them. All the subjects had this opinion that meal was essential to maintain physique and to avoid weakness. Breakfast (45.5%) was the most frequent skipped meal among girls of both age groups in both areas. Occasionally outside eating was observed in 44.4 and 23.3 percent in early and late adolescent age group.
Samosa was the most favourite snack among early adolescent subjects and about 66.7 percent subjects of rural area and 35.6 percent subjects of urban area preferred to have samosa with chutney. However, the percentage of samosa preference in late adolescence subjects was 23.3 percent in rural area and 26.7 percent in urban area. After getting nutrition education about healthy snacks and junk foods, the preference for samosa diminished in both early and late adolescent subjects. Among the girls from rural area, 93.3% from early age group and 96.7% from late adolescent age group were not taking any health drink, but after getting education, they started to have health drinks like horlicks.

The main reason of eating in between unhealthy snacks like kurkure, crax, fried potato chips, among early adolescent girls (28.9%) of rural area, was to satisfy hunger and among late adolescent girls (23.3%) was due to their habit to munch snacks. Among early and late adolescent girls (26.7%) from urban area it was just to relieved from boredom. After imparting nutrition education, nibbling of unhealthy snacks reduced and responses for don’t take unhealthy snacks in between meals increased from 35.6 to 66.7% in early adolescent girls and from 33.3% to 73.3% in late adolescent girls of rural area and from 11.2% to 62.2% in early adolescent girls and from 46.7% to 83.3% in late adolescent girls of rural area.

Early adolescent girls favoured regular diet (40%) to nutritious (17.8%) diets while the subjects of late adolescence group preferred to have nutritious (50%) diet over routine (30%) diets in rural area. All respondents showed their keenness for the intake of nutritious food but were dependent on their parent’s financial condition. Before imparting nutrition education, fried meal was the leading choice among early adolescent subjects of rural (73.3%) and urban (93.2%) area. Boiled (2.2%) meal was the least choice among early adolescent girls of rural and urban area both. The reason of selection of meals was purely based on taste. However, after conveying nutrition education, preference for mixed meals increased.

Inclination towards fasting because of religious reasons was observed maximum in subjects from a rural area in early (80%) and late (66.7%) adolescence periods in comparison to urban area girls in early (73.3%) and late (60%) adolescence period.
Whereas, all the subjects from rural and urban area had the opinion that meals should be regularly taken because it has a direct effect on the body.

Before imparting nutrition education, 36% early adolescent subjects of rural area had better dietary habits than in (34.22%) subjects of same age group of urban area and the same trend was seen in late adolescent subjects of rural (37.33%) and urban (32%) area. Maximum increase in healthy dietary pattern was seen among the subjects of urban area in late (27.33%) adolescence period followed by early (19.11%) adolescent subjects of urban area.

Before getting nutrition education, around 24.92 percent subjects in early adolescent age of rural area and 24.65 percent subjects in early adolescent age from the urban area had knowledge about food groups, nutrients, junk and healthy foods and common nutritional problems. Whereas, in late adolescence group of the rural area, it was 30.81 percent and 32.53 percent in subjects of the urban area. After imparting nutrition education, the changed percentage figures were 69.49 in early and 81.10 in late adolescent age group of rural area and 72.26 in early adolescence and 82.02 in late adolescent age group of the urban area. The maximum (50.20%) increase in knowledge was noticed in early adolescent subjects of rural area. However, a significant change was seen in both early and late adolescence subjects of the rural and urban area.

Before imparting nutrition education, among subjects of early adolescence period from rural and urban area, only 37.75% and 35.09% respectively, were aware of the ways to maintain good health. After giving nutrition education, the figure for awareness about health changed to 82.11 and 84.21 percent, respectively. Likewise, the percentage of consciousness about good health in late adolescence subjects of rural and urban area increased after imparting nutrition education from 40.0% to 84.39% and from 41.23% to 88.60% respectively. The maximum (49.36%) percent increase in awareness was seen in the early adolescent subjects of rural area.

Among all subjects belonging to the rural and urban area, positive attitude towards health was found only in 31.65% early adolescent girls and 39.08% late adolescence girls belonging to the rural area. However, after imparting nutrition education, early (80.08%) and late (82.76%) adolescent girls changed their attitude toward health for their betterment. Whereas after imparting nutrition education, figures in subjects of urban area
increased from 34.10% to 82.91% in early adolescent girls and from 41.03% to 87.36% in late adolescent girls.

Before imparting nutrition education, there were misconceptions about foods among subjects belonging to the rural and urban area. This might be because of their parent’s beliefs for different foods. Maximum percent of students had misconceptions about foods and gave wrong answers. After imparting nutrition education, the correct responses increased from 24.10 to 77.61 percent and from 36.24 to 79.49 percent in subjects in early adolescence belonging to the rural and urban area, respectively. Whereas, in late adolescent girls belonging to the rural and urban area, the correct responses increased from 28.21 to 76.15 and from 34.62 to 78.72 percent, respectively.

Data of nutrient intake before imparting nutrition education in girls belonging to both rural and urban area indicated that in early adolescence period, intake of calories (1281.1 to 1452 Kcal per day), proteins (30.13 to 45.10 gm per day), iron (15.6 to 19.95 mg per day) was much less than the recommendations given by ICMR. The mean intake of calories was found maximum in the subjects of urban area. Intake of calories (1483.18 to 1619.6 Kcal per day), proteins (41.4 to 51.87 gm per day), iron (14.67 to 20.83 mg per day) in late adolescent girls was also found less than ICMR recommendations. However, the mean intake of proteins was very near to the recommended amounts. After imparting nutrition education, a substantial increase has been observed in the intake of calories (5.65 to 9.33%), proteins (5.94 to 8.75%), iron (5.91 to 16.91%) in the early adolescent subjects belonging to both rural and urban area. Similarly, a significant increase in the mean intake of calories (4.51 to 8.94%), proteins (5.64 to 9.81%) and iron (4.51 to 8.76%) has also been seen in the subjects of late adolescence.

The increase in growth parameters was noticeable in the subjects of early adolescence as compared to the subjects of late adolescence. Marked increase in growth parameters i.e., height (0.06 to 1.62%) and weight (0.68 to 3.72%) was noticed in the subjects of early and late adolescence periods respectively. Maximum percentage increase in BMI was noticed in the subjects of subgroup GNEAA (1.16%) of early adolescence belonging to urban area and subgroup GNEVA of late adolescent age group of rural area. The respective percent mean increases for mid-upper arm circumference (0.81 to 2.62% and 0.44 to 1.01%) was recorded in the subjects of urban area to whom nutrition education
was imparted with audio-visual aids and about calf circumference (0.49 to 2.32% and 0.51 to 0.86%), maximum increase was observed in subjects of control group of rural area. However, percent increase in chest circumference (normal) in early and late adolescence periods i.e. 0.33 to 2.02 and 0.30 to 1.34 and chest circumference (expanded) in respective groups was 0.47 to 2.65 and 0.38 to 1.24 percent. Maximum increase was seen in chest circumference (normal and extended) in subjects of subgroup GNEAA of rural area to whom education was imparted through audio aids alone.

Haemoglobin levels of the selected subjects before starting the experimental trial were between 8.47 to 9.70 and 7.38 to 10.09 g/dl of blood in early and late adolescence period, respectively. The respective figures of the subjects in early and late adolescence period for serum iron and total iron binding capacity (TIBC) were 68.24 to 92.52 µg/dl in early adolescent girls, 68.40 to 82.55 µg/dl in late adolescent girls and 367.20 to 439.47 in early adolescent girls, 405.30 to 458.90 µg/dl in late adolescent girls, respectively. After imparting nutrition education through audio, visual and audio-visual aids, a significant increase in the levels of haemoglobin and serum iron as well as a decrease in total iron binding capacity (TIBC) has been recorded. However, a non-significant change was noticed in the subjects to whom no education was given. In early adolescents, the maximum increase in the level of Hb (8.61%) and serum iron (14.75%) was noticed in the subjects of rural area to whom nutrition education was imparted through audio-visual aids. In early (12.54%) and late (6.41%) adolescents, maximum decrease was noticed in the subjects of urban area who were given education through audio-visual aids.

From different psychological tests applied on self-confidence, self-expression (at school and home) and study habits, a positive response has been observed in the subjects of early adolescence period as compared to late adolescence period, irrespective to their areas. Among subjects of early adolescence period, maximum change in self-confidence was noticed in the subjects to whom nutrition education was imparted through audio-visual aids. Likewise, in subjects of late adolescence period, maximum increase in self-confidence was noticed in the subjects belonging to subgroup GNEAVA. Maximum change in self-confidence among early adolescents was observed in the subjects of the urban area (15.69%). Similarly, in late adolescent subjects, the maximum
increase in self-confidence was noticed among the subjects of urban area (12.88%). Decrease in the scores of sense of alienation (hence increase in level of self-confidence), the level of self-confidence in subjects changed from low to average among early adolescence period of both areas. Maximum increase in self-confidence (decrease in sense of alienation) was seen in those subjects to whom nutrition education was imparted through audio-visual mode.

No consistent trend in the improvement of study habits was seen in the subjects from both age groups. Before imparting nutrition education, all the subjects obtained mean raw scores ranged from 20.40 to 25.40 that rose to 21.80 to 28.20 in early adolescence period. After imparting nutrition education, students still showed poor study habits. The maximum increase in the scores for determining the study habits of the experimental subjects was noticed in those to whom nutrition education was imparted through audio-visual aids in both the age groups of the rural area. The maximum percent increase mean in the acquired scores by early adolescent subjects of rural area was 12.67% in GNEAVA.

In late adolescence period, mean raw scores for adjudging study habits before imparting nutrition education ranged from 15.10-23.70 and it increased to 16.10-26.0 after giving nutrition education which showed that all the subjects still had poor study habits. Maximum percentage increase in the scores obtained for adjudging study habits was observed maximum in the subjects GNEAVA (11.63%) belonging to the rural area.

In early adolescents from both rural and urban areas, the mean raw scores to identify students’ self-expression at home were from 17.80 to 24.60 before imparting nutrition education, which changed to 14.80 to 22.60 after imparting nutrition education. The girls from rural and urban area had low to an average sense of deprivation. Maximum percent decrease in the mean scores obtained by the subjects were 16.85% in rural and 13.17% in urban area respectively to whom nutrition education was imparted through audio-visual aids. An increase in self-expression scores with a change in the area has also been observed.

Whereas, in late adolescence period, after imparting nutrition education, a change was observed in the mean scores of all the subjects of the rural and urban area except in the subjects of no education (control) group. Maximum (16.77%) improvement in self-
expression (at home) was noticed in the subjects of rural area (GNEAVA) getting nutrition education through audio-visual aids followed by subjects belonging to urban (15.02%) area of the same sub-group. A marked change in sense of deprivation from average to low (hence high self expression) was seen among girls of both age groups to whom nutrition education was imparted through visual aids alone and audio-visual mode.

Initially, at the school level, all the subjects from early adolescence period had an average sense of deprivation as the mean raw scores obtained by the students belonging to rural and urban area before imparting nutrition education were from 20.80 to 27.93. After imparting nutrition education, the scores obtained by the subjects were from 19.20 to 24.00. The maximum percentage decrease in the scores (hence increase in self-expression) was observed in the subjects to whom nutrition education was imparted through audio-visual aids (GNEAVA) belonging to rural (11.93%) area followed by urban (11.59%) area in the same subgroup.

In late adolescence period, mean raw scores obtained by all the subjects to see their sense of deprivation at school ranged from 21.70 to 31.60 before imparting nutrition education. The changed scores after imparting nutrition education were from 18.90 to 29.20. Maximum (13.3%) decrease in the mean raw scores was noticed in the subjects belonging to urban area getting nutrition education through audio-visual aids (GNEAVA) followed by the same group of rural (12.9%) area. Noticeable changes were observed in self-expression from average to high at school in subjects of rural area of subgroup GNEAVA to whom nutrition education was imparted through audio-visual mode.
The study entitled “Nutritional Status and Eating Behavior of Adolescent Girls on Intervention with Nutrition Education in District Kurukshetra” highlighted the effectiveness of nutritional education program provided to the selected rural and urban adolescent girls. Nutrition education given to girls has a positive effect on Knowledge, dietary practices as well as on their attitude towards nutrition and health. The daily intake of calories, proteins, and iron by teenagers of both age groups was lower than the recommended dietary allowances (RDA). An improvement in the intake of nutrients has been observed, on imparting nutrition education.

Marked increase in growth parameters (height, weight, MUAC, calf circumference and chest circumference) was recorded in the subjects in early adolescence as compared to late adolescence after giving nutrition education through audio-visual aids. This might be due to the early adolescent age (13-15 years) which is still a period of growth. The increase in haemoglobin and serum iron levels in all experimental groups was measured after imparting nutrition education through different methods. The increase in haemoglobin and serum iron was seen in the subjects to whom nutrition education was imparted through audio-visual aids followed by audio aids alone. In the case of a behavioural aspect of adolescent girls, maximum improvement in self-confidence, self-expression and study habits were further observed in the subjects who received nutrition education through audio-visual aids as compared to audio and video aids alone.

Audio or visual aid alone give limited comprehension of the concept hence; to achieve a comprehensive learning, more than one sense should be involved. Adolescent girls to whom nutrition education was imparted through audio-visual aids learnt with enthusiasm and got better learning through audio-visual aids. Thus, indicating audio-visual aid is better, acceptable and interesting mode of imparting nutrition education which enriches and ensures a better learning.

Nutrition education imparted through audio-visual aids is a vital measure to improve dietary conducts and food selections of the adolescent girls as poor knowledge about nutritious foods are the chief causes of the poor nutritional status of the adolescent girls.

Hence, it can conclude from the present study that nutrition education given through
audio-visual aids is a dynamic allotment to develop good dietary conducts and food selections of the adolescent girls, as deprived dietary behaviors and obliviousness are the chief causes of the poor nutritional status of the adolescent girls. It would not only progress the health of adolescent girls, but future generation will also incline, as adolescent girls are would be mothers.

It was further suggested that to bring this to common practice, the good efforts are required by the government agencies and NGO’s to educate students and their families members, especially females by arranging repeated Health and Nutrition Programs for them through nutrition experts. Apart from this, schools should Create interesting and well-illustrated audio-visual teaching aids to educate students on Health and Nutrition by preparing simplified content for Health and Nutrition Programs in local languages.