SUMMARY AND CONCLUSION

Non-communicable diseases (NCD) such as high blood pressure, diabetes and heart disease are emerging and accelerating among industrial population at an alarming rate. These disease burdens occur in productive mid-life period and will, therefore, adversely affect workforce productivity and economic development. The present study was thus planned with a central aim of designing and implementing a nutrition health promotion programme in a selected industry located in an urban Indian city and thereafter, evaluating the impact of the same on the knowledge, attitude and practices, nutritional and health profile of the employees.

Broad Objective

To evaluate the impact of a nutrition health promotion programme in an industry located in an urban Indian city on the knowledge, attitude and practices as well as nutritional and health profile of employees.

Specific Objectives

- To assess the existing nutrition and health related policies, canteen facility and recreational activities in industry using pretested, standardized and adapted Worksite Wellness Index (Texas State Department of Health Services 2004).
- To assess the prevalence of NCDs and their risk factors among the employees by WHO STEPS approach (Bonita et al 2001) using pretested, standardized and adapted WHO STEPS questionnaire (WHO STEPWISE Approach 2008).
- To evaluate knowledge, attitude and practices of employees regarding NCDs and principles of healthy lifestyle using a pretested, standardized questionnaire.
- To develop and implement a nutrition health promotion programme in the industry.
- To identify the bottlenecks and facilitating factors in implementing a nutrition health promotion programme in a workplace setting.
- To evaluate the effectiveness of the nutrition health promotion programme on knowledge, attitude and practices as well as nutrition and health profile of employees after an intervention period of 6 months.

Methodology

The methods used for the study are briefly summarized below.

In the first phase of the study, an industry located in urban Vadodara was selected as the study setting after obtaining the requisite permissions from the industry Head. The Worksite Wellness Index Questionnaire (WWI) developed by Cardiovascular Health and Wellness Programme –

Texas Department of State Health Services in 2004 was pretested, standardized and adapted before using on the local industry (Appendix 2). The questionnaire was administered to the Admin. & Personnel Head and thereby, information regarding the industry's existing nutrition and health policies as well as canteen and recreational facilities were obtained. The answers so obtained were analyzed and the industry was evaluated regarding its strengths and weaknesses with respect to nutrition and health policies as per the WWI questionnaire format.

In the second phase of the research study, all the employees of the industry (n=650) were contacted and requested to give their consent for assessment of their diet & lifestyle risk factors, blood tests (for those who would be identified as being 'at risk' i.e. having a constellation of three or more risk factors) and participate in the nutrition health promotion programme using a written, informed consent letter (Appendix 1). The consenting employees (n=504) were enrolled as study subjects. Assessment of the risk factor profile of these study subjects was carried out using pretested, standardized and adapted (according to local conditions) WHO STEPS Questionnaire which was modified according to local conditions (Appendix 3). Before enrolling, each employee was explained the objectives of the study and his/her involvement in the same. Baseline data was collected regarding:

- Background information
- Education level
- Designation
- Housing status – whether living alone/with family
- Marital status
- Behavioral risk factors
- Addiction pattern
- Low Fruit and vegetable intake
  (< 400 gm/day as per WHO 2003 & Dietary Guidelines for Indians 2007)
- Frequency of eating out
- Dependence on food service available at workplace for meals
- Physical activity as per CDC 2008, Consensus for Asians criteria 2009
- Medical history
- Anthropometric measurements
- Height
- Weight
- Waist circumference (WC Classification for Asian adults, 2000)
- Hip circumference
- Blood pressure measurement (JNC VII Classification)

The data collected in Phase 2 was analyzed and the subjects who showed presence of 3 or more risk factors out of all the following were identified as being 'at risk':

- Current Tobacco consumption
- High Alcohol consumption (CDC, 2010)
- Low fruit and vegetable intake
  (WHO/FAO 2002, NIN 2007)
- Physical inactivity
  (CDC 2008, Misra et al 2009)
- Medical history of hypertension
- Medical history of diabetes
- High blood pressure (JNC VII 2004)
- High Body Mass Index (Misra et al 2009)
- High Waist Circumference (Misra et al 2009)

After analyzing the results of STEP 1 and STEP 2, the results were communicated to the Admin. & Personnel Head as well as to the employees themselves. 'At risk' employees were identified and requested to undergo biochemical estimation i.e. withdrawal of blood for estimation of fasting blood sugar and lipid profile by a certified lab technician. The results of the blood tests were communicated to the participating employees and each employee was given a photo copy of their respective test reports. Also, a brief interpretation of the test results along with health and dietary guidelines to prevent and manage blood sugar and cholesterol levels were provided to them via e-mail.

In the fourth phase of the study, all the study subjects (n=504) were invited to attend the nutrition health promotion programme sessions. Prior to the initiation of the power point sessions, the KAP questionnaires were distributed among the subjects and the questionnaire was explained to them point-by-point. They were then asked to fill up the questionnaire in the presence of the researcher. Information regarding healthy diet and lifestyle behaviors, such as awareness of normal levels of BMI, B.P., cholesterol and fasting blood sugar, formula to calculate BMI, importance of following healthy lifestyle, perceptions about own health as well as awareness and knowledge about NCDs was thus collected.

Following this, active intervention was given during first month of the intervention period by conducting 2 power point sessions covering important nutrition and health related topics (Appendix 4-A & 4-B). After consulting with the industry management and obtaining the requisite permission from them, sessions of Presentation 1 were held for the first 2 weeks of active intervention every day from Monday to Friday between 12.00 p.m. and 4.00 p.m. in the

industry premises. Similarly, during the following 2 weeks, Presentation 2 sessions were held. Details of the topic of presentation, date, time and duration were communicated to all the employees via e-mail by the Admin. & Personnel Head. All those employees who had participated in Phase 2 of the study and had provided information regarding their general information, diet, lifestyle as well as biophysical parameters (as per WHO STEPS questionnaire) were personally contacted by the researcher via e-mail and invited for the power point sessions to ensure good participation by them in the sessions. Employees were invited to attend any session of their choice during the 2 weeks, as per their convenience.

Over and above this, all the employees (those who attended the sessions as well as others) were provided with soft copy of the presentation via e-mail for ready reference. Along with this, all the industry employees were also provided with the researcher's e-mail address as a helpline which they were encouraged to use to contact the researcher in case of any queries regarding nutrition and health. The queries so received were promptly and efficiently replied to by the researcher.

In the next 5 months of the intervention period, key nutrition and health messages were reinforced using pretested and standardized IEC material:

- **A3 size colored posters** were placed at strategic points (near the water cooler, in the common entrance corridor wall and canteen) in the industry campus. These posters included information regarding – weight management, adequate fruit and vegetable intake, regular physical activity, prevention and management of diabetes, hypertension and cardiovascular disease (Appendix 5).
- **A4 size black and white sheets** printed with key messages pertaining to healthy diet & lifestyle behaviors were made available to the subjects to be used as table mats at the workplace during meal times (Appendix 6).
- **Point-of-decision prompts** in the form of posters placed near lifts-encouraging use of stairs instead of lift were also placed (Appendix 7).

In the fifth i.e. last phase of the study, post intervention data was collected after intervention period of 6 months on the same parameters as those assessed at baseline (i.e. KAP as well as STEP 1 & STEP 2 i.e. diet and lifestyle habits including anthropometry and blood pressure) using pretested, standardized questionnaires. The same questionnaire as those used as baseline were used with certain additional questions pertaining to feedback of intervention (Appendix 9 & 10). Post intervention blood test was also done for IGT and lipid profile. The post-intervention data for all the parameters that were assessed was communicated to the Admin. & Personnel Head as well as the participating subjects who were also given a photo copy of their post intervention blood test report.

Statistical Analysis

The data was entered in a computer using an excel spreadsheet. The data was cleaned and verified after which it was subjected to appropriate statistical analysis. Frequency distribution, mean, standard deviation as well as t-test, ANOVA and chi-square analysis was performed for the data using SPSS statistical software. Results have been presented in tabular and/or graphical form.

The results so obtained have been outlined below:

Phase 1 Assessment of Workplace Nutrition & Health Policies

The workplace under survey was found to be lacking in terms of presence of adequate policies and programmes for creating an enabling environment which could be instrumental in promoting healthy dietary & lifestyle behaviours among the employees. Additionally, there was no separate budget allocation for nutrition health education & promotion of employees and the approach of the industry authorities towards employee health care was restricted to health checkups and treatment of diseases (curative approach) rather than preventive. Though there was a company appointed doctor who visited the workplace once a week, his job comprised only of addressing the complaints of patients who approached him voluntarily i.e. it was purely need based. The workplace scored well in the section of "Health Promotion for Employees". However, this cannot be taken as a true assessment of the health policies of the industry because a detailed view showed that the policy due to which the industry scored was highly inadequate i.e. regular health screening of vital health parameters was provided only for higher level of employees (managers) while lower level of employees were not provided any such facility. The policy was thus, not equitable but was differential and due to the fact that the worksite wellness index does not account for this kind of differential policy, the industry was able to score in the wellness index but was not actually adequate in terms of health promotion policy for employees.

Phase 2 Collection of Baseline Data of Consenting Subjects (Industry Employees)

The study population was relatively young (average age 29.5 years) with most of them being well educated i.e. graduation or above (77%) and were executive (52%) or manager (20.6%) level employees.

At baseline, the risk factors present in the study population, in decreasing order of percent prevalence were as follows: inadequate fruit and vegetable intake (100%) followed by physical inactivity (77%), high BMI (53.4%), prehypertension (49.4%), high WC (35.5%), hypertension (23.6%), smoking (9.1%) and underweight (5.8%). The same has been pictorially depicted in Figure 5.1. It was alarming to see a very high prevalence of suboptimal blood pressure i.e.

prehypertension & hypertension (73%) coupled with poor self-awareness regarding the same in the study population as only 2.7% of the study subjects reported history of hypertension and were on treatment for the same despite the regular visits of company appointed doctor. This clearly points out to the inadequacy of the present need based health care for employees in the industry under survey and indicates the urgent need to initiate regular, mandatory health screenings for all level of employees for the basic health indicators such as blood pressure, IGT and lipid profile the early identification and management of which would go a long way in preventing secondary complications and thus reducing NCD related morbidity and mortality among the population. As has been well documented in literature, in the present study also, higher age (> 25 years) was significantly associated with elevated levels of various anthropometric parameters such as high BMI ($p<0.01$), high WC ($p<0.001$) and high WHR ($p<0.001$). Also, in keeping with the findings of past research, the well established positive relation between high BMI and elevated WC ($p<0.001$), WHR ($p<0.001$) & blood pressure ($p<0.01$) was present among the population in present study.

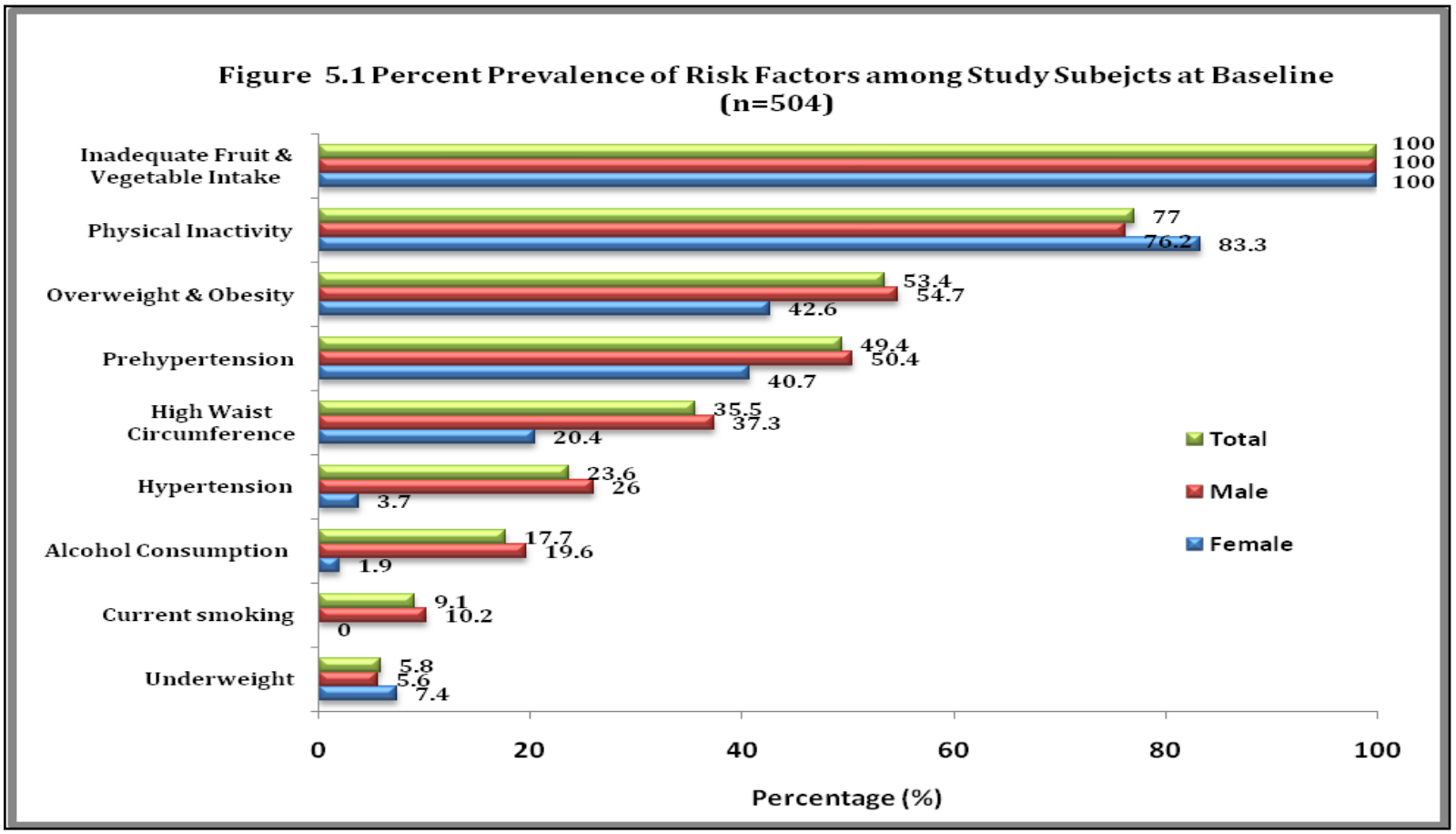


Figure 5.1 Percent Prevalence of Risk Factors among Study Subejcts at Baseline (n=504)
Inadequate Fruit & Vegetable Intake
Physical Inactivity
Overweight & Obesity
Prehypertension
High Waist Circumference
Hypertension
Alcohol Consumption
Current smoking
Underweight
100
100
100
77
76.2
83.3
53.4
54.7
42.6
49.4
50.4
40.7
35.5
37.3
20.4
23.6
26
3.7
17.7
19.6
1.9
9.1
10.2
0
5.8
5.6
7.4
Total
Male
Female
0
20
40
60
80
100
Percentage (%)

Phase 3 Identification of Population 'At Risk' of Developing NCDs and Biochemical Estimation (Lipid Profile & Fasting Blood Sugar) of the Consenting 'At Risk' Population

Out of the total 504 subjects who were enrolled at the initiation of the study, 391 subjects (77.6%) were found to be 'at risk' i.e. having ≥ 3 risk factors for NCDs. These 'at risk' subjects were asked to participate in the next phase of the study which involved estimation of fasting blood sugar and lipid profile of the participants. The findings of this phase revealed that in those 'at risk' subjects who underwent the blood test for biochemical assessment (n=158), the largest was dyslipidaemia (84.8%), characterized by high Triglycerides (24%), Total Cholesterol (28.5%), high LDL Cholesterol (60.7%), high VLDL Cholesterol (12%), abnormal HDL Cholesterol (42.4%), abnormal TC/HDL ratio (22.1%) and abnormal LDL/HDL ratio (20.9%) which is well expected because the 'at risk' people are most susceptible to cardiovascular diseases and dyslipidaemia is a channel leading to development of cardiovascular diseases. One third of the consenting 'at risk' subjects (29%) were found to have metabolic syndrome which was not surprising since metabolic syndrome is a clustering of various risk factors for NCDs including high waist circumference, high blood pressure, altered lipid profile & IGT which predisposes individuals to development of NCDs. Prevalence of IGT was as high as 12% in the consenting 'at risk' population. Most of the subjects who were found to have IGT were either unaware of their condition or had never gotten their blood sugar tested in their life. Being a potential risk factor for development of secondary complications, it is vital that IGT is identified and managed at the earliest for which regular screening of the population at large is essential.

Phase 4 Implementation of Nutrition Health Promotion Programme and Assessment of Knowledge, Attitude & Practices of Subjects Regarding Nutrition & Health Issues

With regards to KAP (Knowledge Attitude and Practices) of the subjects who participated in the nutrition health education sessions (n=126), the overall findings indicated that the subjects who participated in this phase had very superficial knowledge about the various aspects of healthy diet and behaviours, for example, though most of the subjects were aware of the fact that they should maintain normal weight (63.5%), blood pressure (88.9%), blood sugar (77%) and cholesterol (69%), very few of them were able to give the correct values for normal BMI (0.8%), normal blood sugar levels (0%), normal range of blood pressure (12.7%) or even blood cholesterol (2.4%). Similarly, a small percentage of these subjects were able to answer correctly when asked about the formula for BMI (3.2%). When asked if they had ever tried to find their own ideal weight, a higher percentage (65%) replied in the affirmative. However, the subjects exhibited fair knowledge about the various reasons causing weight gain in adulthood (23.8% to 80.9%). The results have been summarized in Figure 5.2.

Among all the healthy practices undertaken by the subjects who participated in the nutrition health education sessions at baseline, highest prevalence was for avoidance of tobacco usage in all forms, followed by making effort such as climbing stairs instead of lift, avoiding alcohol, avoiding junk food and so on. The detailed data has been presented in Figure 5.3. Though most of them gave utmost importance to maintainance of healthy weight, B.P., cholesterol and blood sugar, this was not reflected in their practices. Only about 65% of the subjects had ever tried to find their ideal weight (Figure 5.4) and around half of the population (52%) made efforts to lose weight whereas even smaller percentages reportedly made some or the other effort to maintain or lower their cholesterol (21.4%), B.P. (19%) and blood sugar (20.6%). Also, while 37.3% subjects claimed to be indulging in at least 30 minutes of MIE (Moderate Intensity Exercise) on a daily basis, the information collected from these subjects during baseline data collection revealed that only 24.5% of them were actually 'physically active' as per physical activity guidelines for Asians (Consensus for Asians 2009). Similarly, while 60.3% subjects said that they consumed at least 4-6 bowls of fruits & vegetables, according to detailed fruit & vegetable intake survey conducted in STEP 1, none of them actually met the criteria for recommended fruit & vegetable intake i.e. >400 gm/day (Dietary Guidelines for Indians – A Manual. NIN, Hyderabad – 1998, reprint 2007).

In addition to asking what health practices are being followed by the subjects, they were also asked if they thought that these positive lifestyle changes would help them in improving their health. Almost all the subjects (97.6%) said that they felt that these healthy behaviours would help in maintainance and boost their health (Figure 5.4).

Figure 5.2 Percent Prevalence of Subjects who Attended Nutrition Health Promotion Programme Sessions Regarding Knowledge & Perception of Key Nutrition & Health Issues at Baseline(n=126)

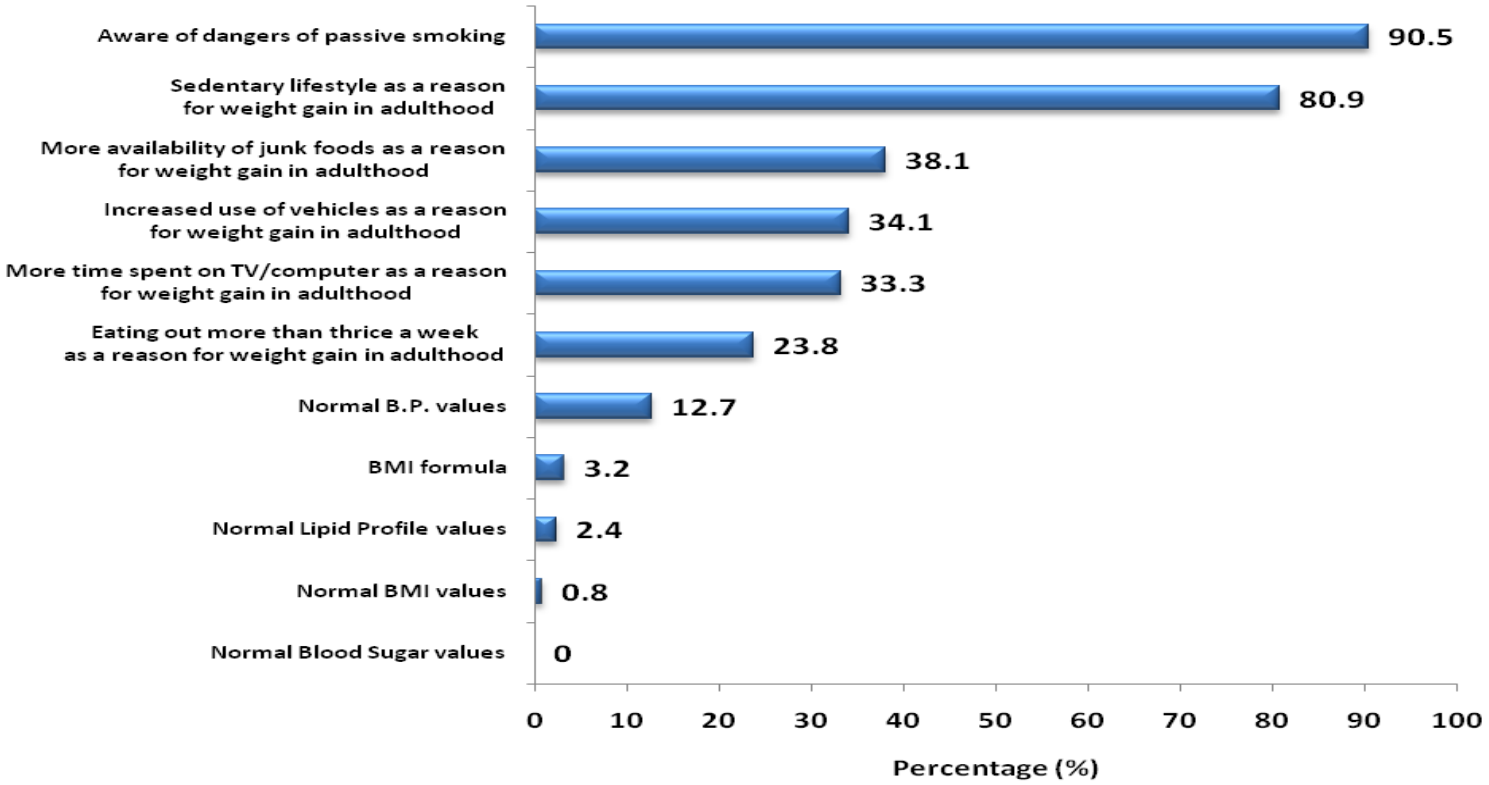


Figure 5.3 Percent Prevalence of Healthy Practices Followed by Subjects who Attended the Nutriton Health Promotion Programme Sessions at Baseline (n=126)

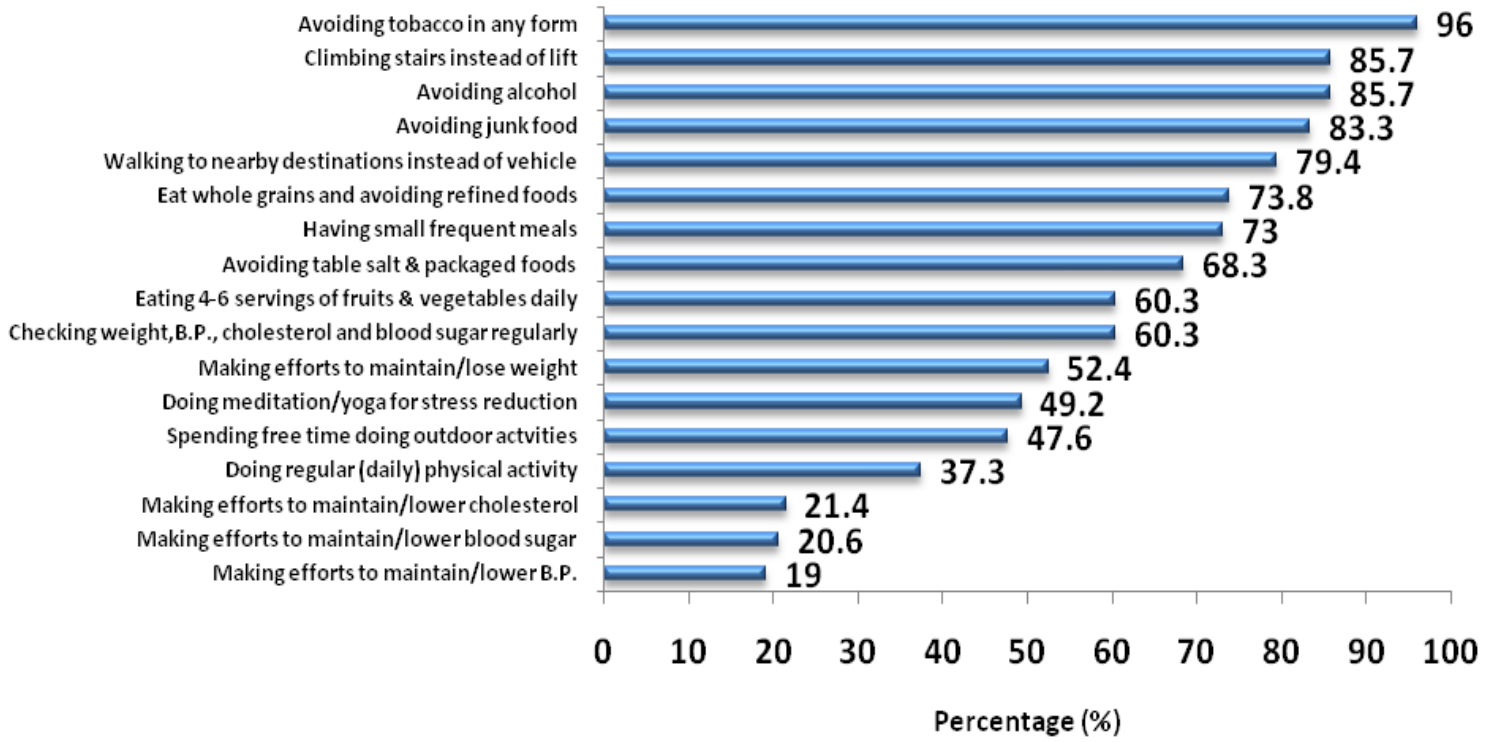
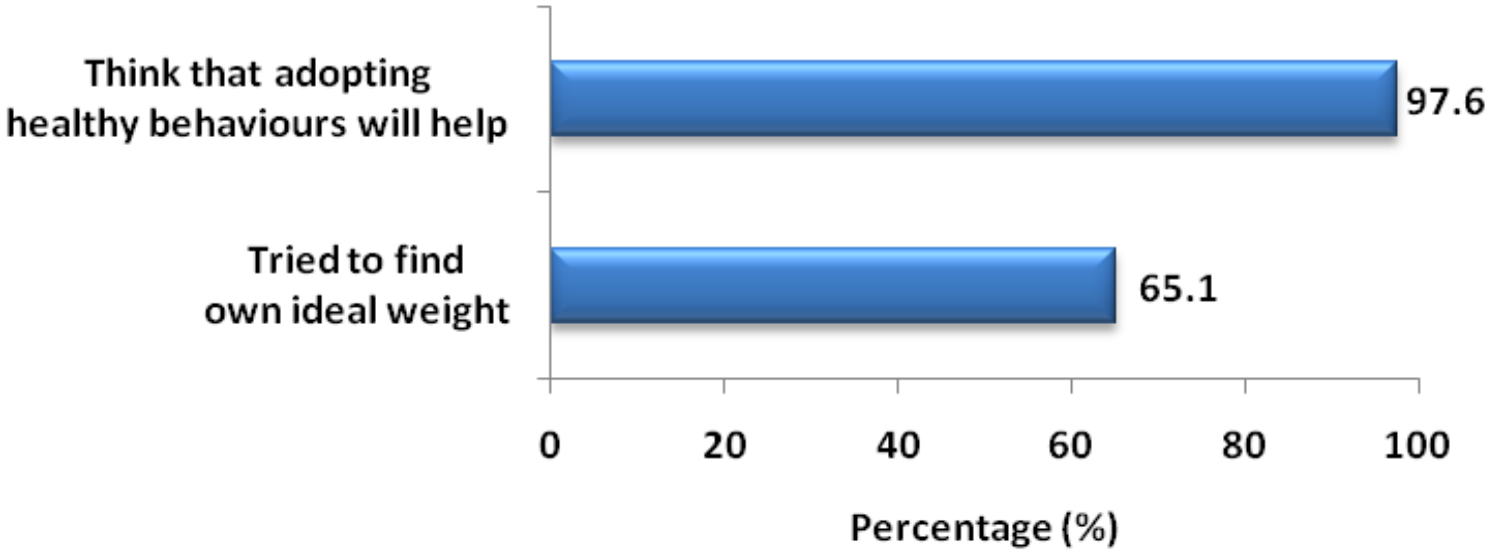


Figure 5.4 Percent Prevalence of Subjects who Attended Nutrition Health Promotion Programme Sessions Exhibiting Healthy Attitudes Regarding Adoption of Healthy Behaviours at Baseline (n=126)



Phase 5 Impact of the Nutrition Health Promotion Programme in the Workplace Setting

Looking at the comparison between the baseline and post intervention data of study subjects who remained in the study till its completion (n=83), it can be seen that there was an appreciable improvement in the knowledge, attitude, practice as well as perceptions of subjects. With respect to increase in percentage of subjects having correct knowledge & perceptions about various key nutrition and health issues after intervention as compared to baseline, as can be seen from Figure 5.5, highest percentage increase was in subjects who could correctly answer the normal lipid profile and blood sugar values by the end of the study period (100%). The reason why the percent increase for these two parameters is 100% is that the initial percentage for the same was 0% i.e. at baseline; none of these subjects could correctly answer these two questions while after baseline few of them (4 and 3 subjects respectively) answered correctly. Hence, the percent increase came out to be highest at 100%. It should be noted here that these percentages signify the percent increase in subjects who answered correctly and after intervention and not the percent prevalence of subjects who did so. There was also a considerable percent increase in subjects who could correctly give the formula for BMI (94.4%) as well the normal BMI values (90.9%) after intervention period. In the case of the questions pertaining to knowledge about passive smoking and 'sedentary lifestyle as a reason for weight gain', the percent increase in subjects having correct knowledge about it after intervention was found to be relatively small but this was due to the fact that there was a high proportion of subjects who already knew about these at baseline (80.7% and 91.6% respectively).

With regards to questions which assessed the attitude of subjects before and after intervention, it was seen that when subjects were asked if they thought that adopting healthy behaviours would help them, all of them replied in the affirmative before as well as after the intervention period. Also, there was a 23.5% increase in the subjects who said that they had tried to find their own ideal weight.

There was also a considerable improvement in self-reported prevalence of healthy practices which is substantiated by the outcome measures such as BMI, blood pressure and biochemical parameters (presented in the later part of this phase). Highest percent increase was noted in the subjects who claimed to be making efforts to lower/maintain their cholesterol (47.1%) followed by those who sad that they made efforts to lower or maintain their B.P. (42.3%), blood sugar (37.5), those who said that they checked their vital health parameters regularly (27.4%) and so on. The detailed results have been graphically represented in Figure 5.6.

Scores were assigned to the questions included in the KAP questionnaire and thereby a comparison was done between the scores obtained by subjects at baseline and at the end of the study to see the change in the same. This comparison showed a significant improvement in the average knowledge, attitude, perception and practice scores of the subjects after the

intervention, as compared to baseline ($p<0.001$) suggesting that there was a noteworthy positive effect of the nutrition health promotion programme intervention on the subjects who attended the same. The detailed scoring method is explained in the METHODS section.

With regards to changes in percent prevalence of unhealthy behaviours and negative health status among study population, it was seen that there was a significant reduction in the number of subjects who had suboptimal blood pressure level ($p<0.001$) and those who were physically inactive ($p<0.05$). With regards to other parameters, though not statistically significant, there was considerable reduction in them; abdominal obesity (32.5% to 21.7%), smoking (7.2% to 3.6%), overweight & obesity (42.2% to 39.8%), inadequate fruit and vegetable intake (100% to 98.9%) while alcohol consumption prevalence remained unchanged (13.2%). The data has been graphically presented in Figure 5.7. With respect to fruit and vegetable intake of subjects, although the percentage of subjects eating >400 gm fruits & vegetables per day did not increase substantially, there was an overall increase in the percentage of subjects consuming higher quantity of fruits & vegetables as compared to baseline. For example, while at baseline only 12% of the subjects consumed at least 250 gm of fruits & vegetables per day, after intervention, this percentage rose to 25.3%. While the average daily recommended intake of at least 400 gm fruits & vegetables per day was not met by majority of the subjects, nevertheless, there was an encouraging trend seen in the population towards higher consumption of fruits & vegetables i.e. there was an overall improvement in the quantity of average fruit and vegetable consumed by the subjects.

A comparison was also done between the mean values of various health parameters before and after intervention and it was found that there was highly significant reduction in the mean SBP & DBP values of subjects ($p<0.001$) as well as the mean hip circumference measurements ($p<0.001$) after the intervention phase. The mean weight, BMI and waist circumference of subjects remained more or less unchanged.

When a comparison was made to see the change in percent prevalence of 'at risk' subjects i.e. those having at least 3 risk factors of NCDs ($n=83$) before and after intervention, it was found that there was a significant drop ($p<0.01$) in the same. At the end of the intervention period, 31.7% of 'at risk' subjects had moved to 'not at risk' category, thus diminishing their risk of developing NCDs in the future. In keeping with this, as can be seen from data presented in Figure 5.8, marked reduction was observed in the percentage of subjects who suffered from IGT (56%) as well as dyslipidaemia (11%). Also, the drop in mean fasting blood sugar level of subjects after intervention was found to be statistically significant at $p<0.001$. A noteworthy drop was also seen in other lipid profile fractions; TC/HDL (55%), abnormal HDL (41%) and VLDL (14%) with a statistically significant rise in the mean HDL levels of subjects ($p<0.05$). With respect to other lipid fractions; the percent prevalence of subjects having high TC and abnormal LDL/HDL ratio

remained unchanged while there was a small increase in percentage of subjects having high TG (25%) and high LDL cholesterol levels (10%). These were however not statistically significant. It can thus be concluded that the reduction in dyslipidaemia was mainly attributable to the improvement in HDL and VLDL status of the study population. The detailed data has been graphically presented in Figure 5.6.

The improvement in knowledge, attitude and practice in the present study is very well reflected in the improved health profile of subjects. This clearly indicates the effectiveness of a well-planned and executed worksite wellness programme and proves its potential as a preventive health care measure for ensuring the well-being of the employees and in turn increased productivity and financial gain for the employers. Sustained efforts, however, need to be taken by the industry management to ensure continued reinforcement of key health messages for the employees for successful formation of a health friendly workplace.

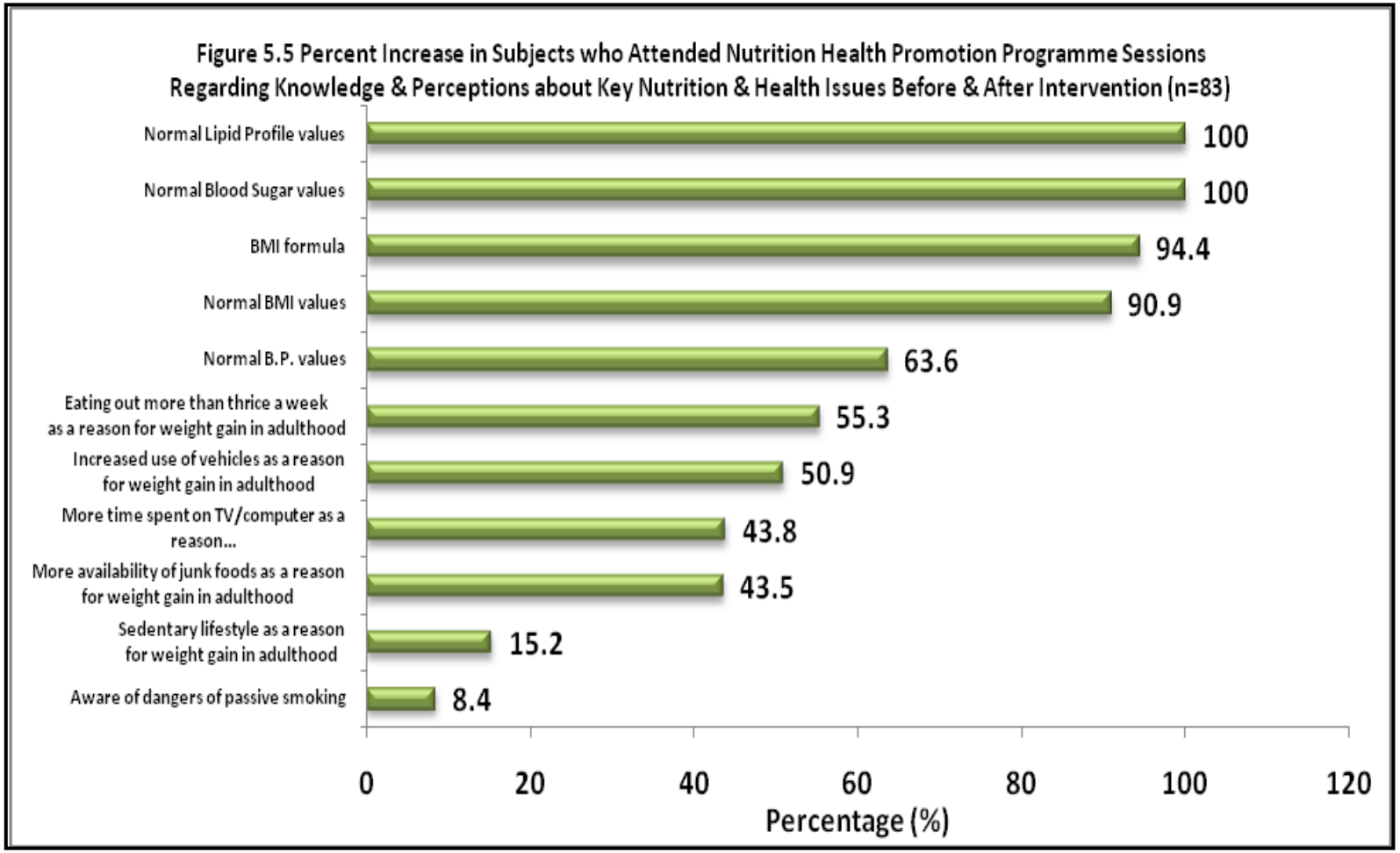


Figure 5.5 Percent Increase in Subjects who Attended Nutrition Health Promotion Programme Sessions Regarding Knowledge & Perceptions about Key Nutrition & Health Issues Before & After Intervention (n=83)
Normal Lipid Profile values
100
Normal Blood Sugar values
100
BMI formula
94.4
Normal BMI values
90.9
Normal B.P. values
63.6
Eating out more than thrice a week as a reason for weight gain in adulthood
55.3
Increased use of vehicles as a reason for weight gain in adulthood
50.9
More time spent on TV/computer as a reason...
43.8
More availability of junk foods as a reason for weight gain in adulthood
43.5
Sedentary lifestyle as a reason for weight gain in adulthood
15.2
Aware of dangers of passive smoking
8.4
0
20
40
60
80
100
120
Percentage (%)

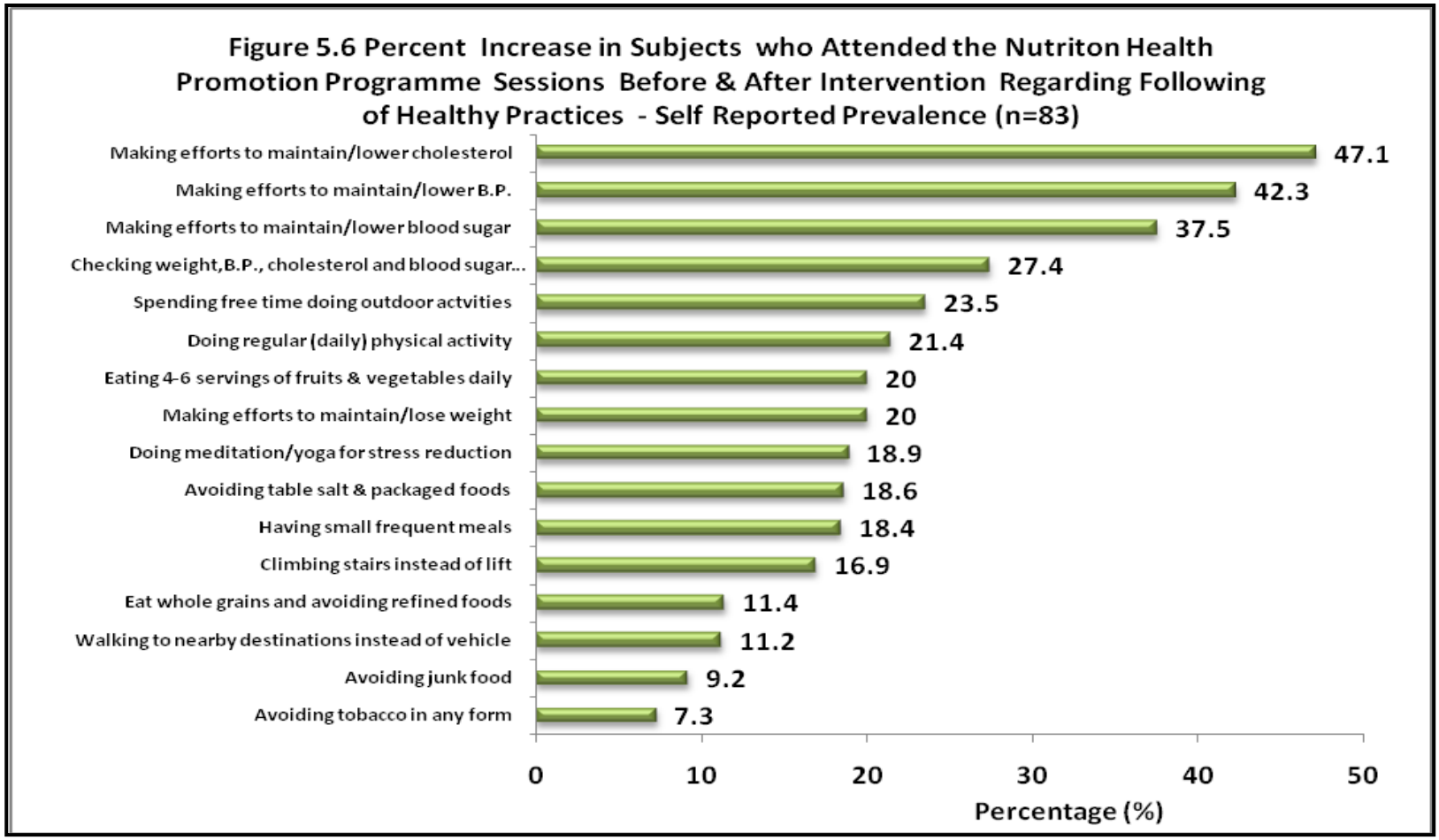


Figure 5.6 Percent Increase in Subjects who Attended the Nutriton Health Promotion Programme Sessions Before & After Intervention Regarding Following of Healthy Practices - Self Reported Prevalence (n=83)
Making efforts to maintain/lower cholesterol
47.1
Making efforts to maintain/lower B.P.
42.3
Making efforts to maintain/lower blood sugar
37.5
Checking weight,B.P., cholesterol and blood sugar...
27.4
Spending free time doing outdoor actvities
23.5
Doing regular (daily) physical activity
21.4
Eating 4-6 servings of fruits & vegetables daily
20
Making efforts to maintain/lose weight
20
Doing meditation/yoga for stress reduction
18.9
Avoiding table salt & packaged foods
18.6
Having small frequent meals
18.4
Climbing stairs instead of lift
16.9
Eat whole grains and avoiding refined foods
11.4
Walking to nearby destinations instead of vehicle
11.2
Avoiding junk food
9.2
Avoiding tobacco in any form
7.3
0
10
20
30
40
50
Percentage (%)

Figure 5.7 Percent Prevalence of Subjects having Unhealthy Behaviors and Negative Health Status Before and After Intervention (n=83)

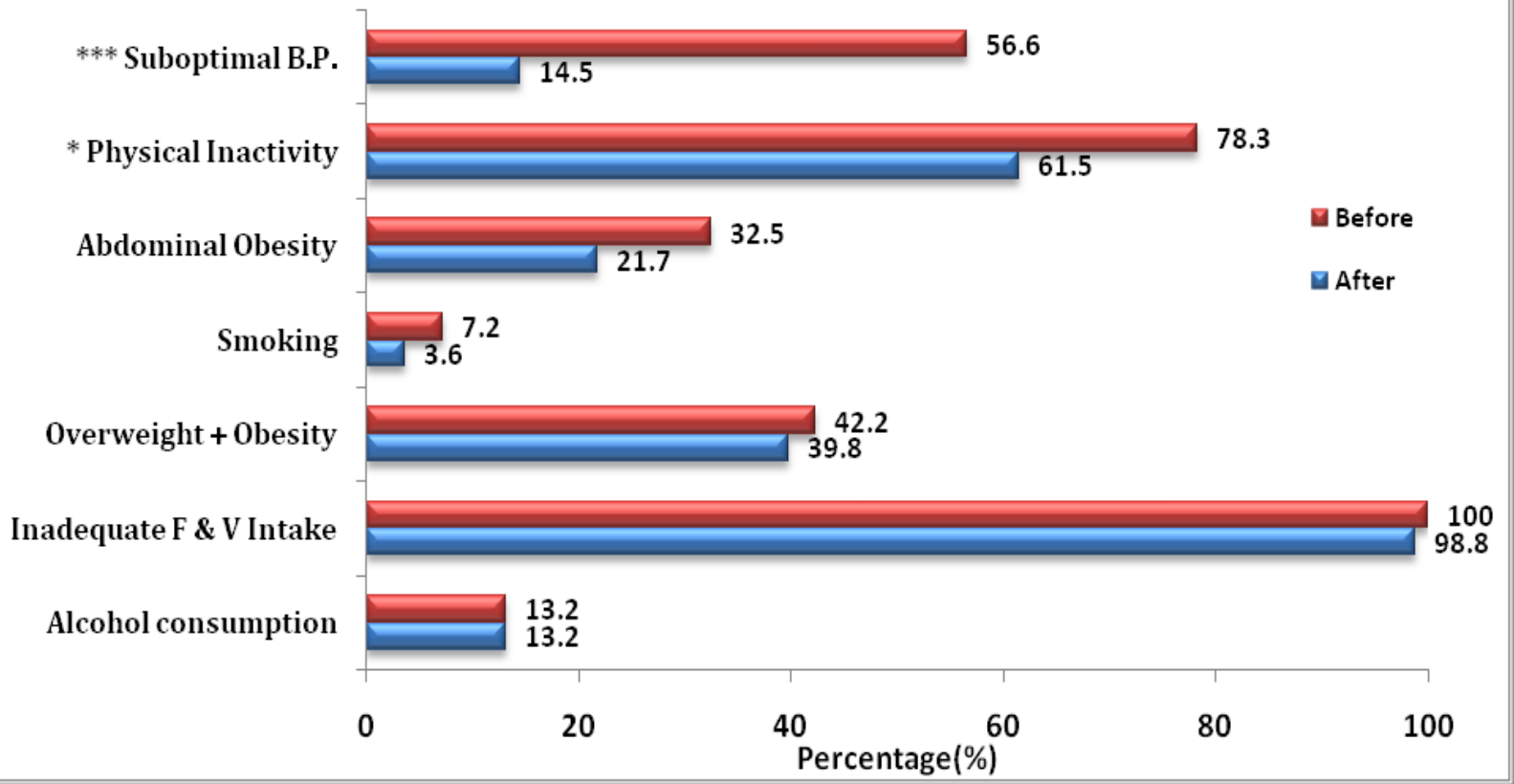
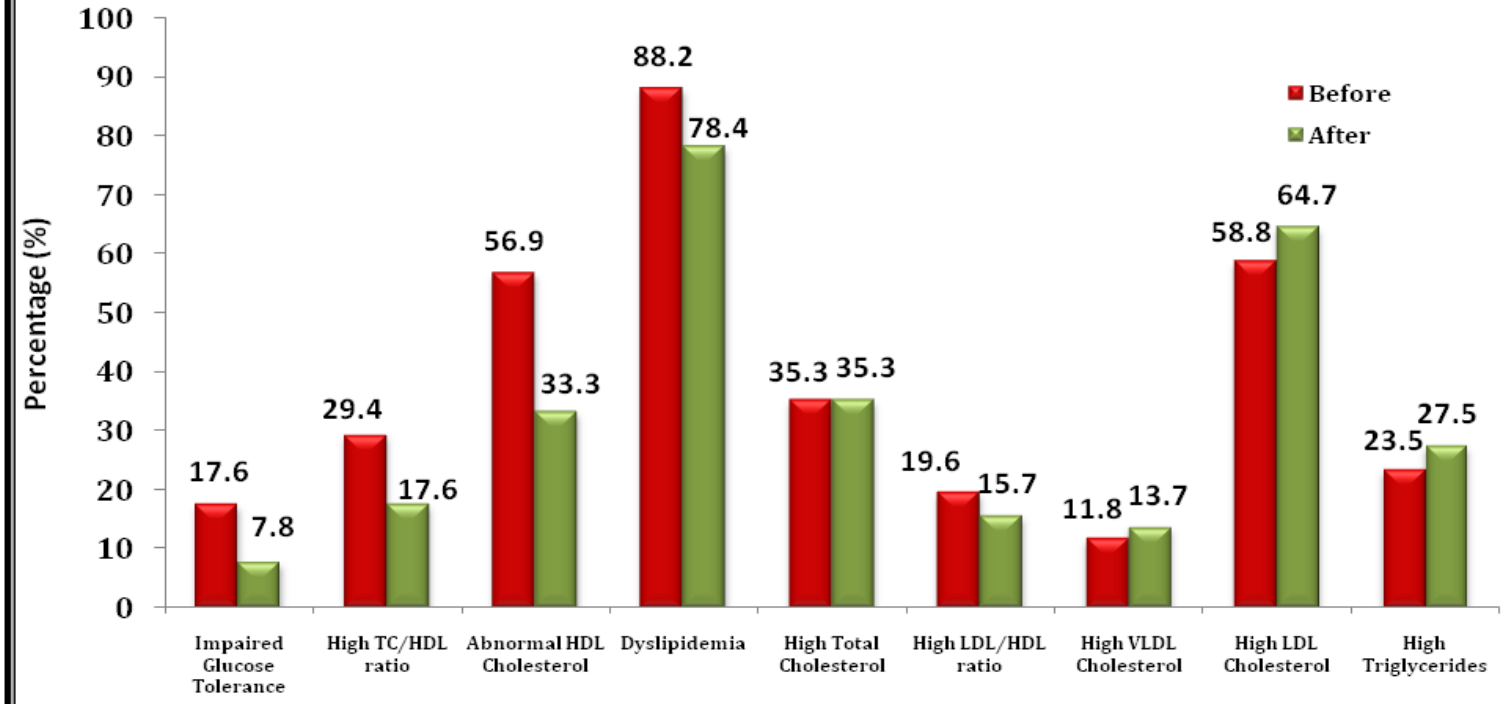


Figure 5.8 Change in Percent Prevalence of Dyslipidemia, Lipid Fractions &Impaired Glucose Tolerance among Study Population Before & After Intervention (n=51)



Bottlenecks and facilitating factors in implementing a nutrition health promotion programme in a workplace setting

One of the major facilitating factors which can be given credit for the successful completion of the present study and the positive result obtained in the form of healthier employees was the willingness of the industry management to assist the nutrition health promotion programme. As has been seen in earlier workplace health promotion researches, such health promotion initiatives are made possible only in the presence of a sensitized and motivated administration. Another advantageous factor in this case, as is in case of any study conducted in a "setting" such as school/workplace was the availability of beneficiaries on regular basis at the same premises. This made it convenient and feasible to address a large number of people at a common location and dispense nutrition and health information to a large audience effectively in short span of time.

One of the most important bottlenecks identifies during the research study was the inability of subjects to participate in all the stages of the study. For example, many of the subjects who had consented to participate in the research study at baseline were unable to attend the nutrition health promotion programme sessions. The low turnout could be attributed to the inability of the employees to spare 30 minutes out of their regular working hours in spite of their willingness to attend the presentation sessions. Another reason for this was that the industry has a high turnover rate. Also, employees are regularly deputed outside the city for professional work and hence many of them became unavailable during subsequent phases of the research study after participating at baseline. Due to the long duration of the study period (20 months), loss of interest might also be one of the causes of the lower participation rate at end of the study period.

Limitations of the Study

- ✓ The attrition rate of the study subjects was high duet to various reasons mentioned below. Therefore, the results of the impact of the nutrition health promotion programme may not be replicable if all the employees had participated in the programme. This is because the participation in the study was purely voluntary and those subjects who were already aware of the consequences of risk factors might have participated in the study while the more unaware and maybe those with higher risks were not willing to participate in the study. This kind of behaviour has been well documented in literature.
- ✓ In spite of the fact that the study was conducted in a 'workplace setting' where subjects were readily available, complete and sustained participation from the employees was not seen due to various reasons such as:
  - High turnover of the staff of the company – many subjects were no longer employed with the same industry at the end of the study period.
  - High incidence of out-of-station deputation of employees; some employees were not present in the city after their initial enrolment during the 2nd phase of the study. Hence, their passive reinforcement as well as blood tests was not possible.
  - Loss of interest – it can be hypothesized that the reason behind absence of employees present in the industry at time of collection of post-intervention data could be loss of interest in the study over course of time (the duration of data collection spanned 20 months).
  - Informal verbal feedback taken from few employees revealed their lack of interest in filling the same form again. Also, some employees admitted that they felt no need to worry about their health at such a young age.

Recommendations

- There is an urgent need for having nutrition and health policies for workplace and school settings which clearly define the roadmap to be taken for health promotion in the settings by surveillance of risk factors and their control. It may be prudent to have mandatory provision of a nutrition and physical activity expert in the workplace and school settings to oversee the nutrition health promotion programme in these settings.
- There is a need for mandatory and sustained efforts in the form of regular nutrition health promotion sessions in the workplace for optimal participation by all employees and thus ensuring maximum benefit of such campaigns for the employers as well as the employees.
- In order to introduce and sustain healthy practices and establish a workplace environment that is conducive to employee health, it is imperative that administrative staff is firstly sensitized and made aware of the necessity of such a programme. Motivated administrative personnel are the key to the development of an employee friendly workplace.
- Since public health approaches for NCD control are promotion of healthy diets and healthy lifestyles, it is important that efforts are also made towards making healthy diets available in all settings by having clear nutrition guidelines for serving of healthy and nutritious food in the premises.
- Any wellness programme should thus be comprehensive, encompassing all the vital components that affect and mould an individual's health such as diet, addiction pattern as well as physical activity. All these play a major role in improving the health, morale and productivity of employees on the one hand and lowering turnover of workplace, improved work output and lower medical reimbursement for the industry. It should hence be part of a comprehensive workplace health promotion programme to achieve maximum benefit**.**
- Physical activity can be promoted in the workplace where employees should be encouraged to walk within the premises instead of using mechanised transport for short distances.
- Keeping in mind that the target audience in workplaces is educated, national & state-level mass media campaigns to highlight the risk factors of NCDs and strategies for their control may go a long way in reducing NCD burden in productive populations.
- Since the roots of dietary and lifestyle behaviour stem from childhood, and considering the fact that children, adolescents and youth are highly influenced by mass media advertisements pertaining to promotion of junk foods, it is important that nutrition health education be mainstreamed across all disciplines in college and school curriculum which will enable and empower them not only to combat the growing NCD epidemic but also learn about nutrition

during entire life cycle and lead healthier lives. Along with this, enabling policies in schools and colleges to practice healthy behaviours, mainly healthy diet and healthy lifestyle with promotion of physical activity should be initialised and sustained in such settings to curb the rising number of risk factors among population right from childhood.