TITLE AND AUTHORS DETAILS

TITLE

PREVALENCE OF RISK FACTORS OF CARDIOVASCULAR MORBIDITY AMONG PATIENTS WITH DIABETES MELLITUS ATTENDING PRIMARY HEALTH CENTRE PANGAPPARA, THIRUVANANTHAPURAM

AUTHORS DETAILS

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ABSTRACT AND KEYWORDS

Diabetes Mellitus is a most common non communicable disease of the developing world. In this, Type2 Diabetes Mellitus ranks number one, in causing cardiovascular risk. The objectives of the study were to assess the prevalence and awareness of risk factors of cardiovascular morbidity among patients with Diabetes Mellitus attending Primary Health Centre Pangappara, Thiruvananthapuram. A descriptive design, cross-sectional survey method was undertaken to assess the prevalence. Sample size was 376. Samples were selected consecutively and data collection was done by interviewing and assessment of physiological parameters viz BP, lipid profile data, body weight, height, and BMI. The data collected was analyzed using SPSS. Chi square and Odd Ratio were used to test the association. Study showed that, prevalence of risk factor of cardiovascular morbidity in patients with Diabetes Mellitus were, 70.5% in low risk group of < 30% and 29.5% in high risk group of ≥30%. There exist significant association between age, gender, unhealthy habits, BP, physical activity and prevalence of risk factors of cardiovascular morbidity among patients with Diabetes Mellitus. In the study, 38.6% had average, 35.4% had good and 26.1% had poor awareness regarding the risk factors of cardiovascular morbidity among patients with Diabetes Mellitus.

Key words: Awareness, Diabetes Mellitus patients, prevalence, risk factors of cardiovascular morbidity.
INTRODUCTION

BACKGROUND OF THE STUDY

Globally, non communicable diseases are the major cause of morbidity and mortality. According to WHO report 2004, they account for the almost 60% of deaths and 47% of the global burden of disease. Cardiovascular and other chronic diseases are becoming the major causes of morbidity and mortality in most of the third world countries including India, especially in the southern Indian states, like Kerala, where most of the health indicators match closely with those of any developed country. Four of the most common non communicable diseases - cardiovascular disease, cancer, chronic obstructive pulmonary disease and Diabetes Mellitus – are linked by common preventable risk factors related to lifestyle.

The two types of Diabetes Mellitus are type 1 and type 2. In people with Type 2 Diabetes Mellitus, the β-cells are not able to produce enough insulin to meet the body’s needs. The majority of people with Type 2 Diabetes Mellitus also had some degree of insulin resistance, due to which the cells in the body are not able to respond to the insulin that is produced. The long term complications of Diabetes Mellitus are macro vascular complications which include coronary artery disease, cerebrovascular disease and peripheral vascular disease.

According to the Diabetes Atlas published by the IDF, by 2025, every 5th diabetic subject in the world be an Indian, the worst affected are the 40-59 year old

A higher prevalence of diabetes is expected in Kerala, since we had the highest proportion of elderly in India. A study in Chengannur reported 16.3% crude prevalence of Diabetes Mellitus among 322 adults aged 20 years or above in an urban
settlement in Kerala. Amrita Diabetes and Endocrine Population Survey identified 9% reported prevalence and 10.5% prevalence of newly detected diabetics among semi urban and urban adult residents aged 18 years and above in central Kerala \(^1\).

The age-adjusted CAD mortality rates per 1000,000 are 382 for men and 128 for women in Kerala. These CAD rates in Kerala are higher than those of industrialized countries and 3 to 6 times higher than Japanese and rural Chinese. CAD in Kerala is premature and malignant resulting in death at very young age. Approximately 60% of CAD deaths in men and 40% of CAD deaths in women occur before the age of 65 years \(^1\).

The average age of a first heart attack decreased by at least 10 years in Kerala, in sharp contrast to a 20 year increase in many western countries. In the 1960s and 70s, heart attack in the young (before the age of 40) was very uncommon in Kerala. Heart attack rate among men in this age group increased 40 fold by 1990 with at least 20% heart attacks occurring before age 40 and 50 \(^1\).

**NEED AND SIGNIFICANCE OF THE STUDY**

The world health statistics 2012 report focused on the increasing burden of NCDs across the world. It says that one in three adults worldwide has high blood pressure, which is directly responsible for a majority of deaths from strokes and heart disease. The report also points out that one in 10 adults globally suffer from Diabetes Mellitus.

In 2011, a special report by the WHO on the burden of NCDs in the SEAR had reported that cardiovascular diseases, stroke, and other chronic diseases resulted
in 7.9 million deaths annually in the region and that one-third of these deaths were premature, occurring before the age of 60\(^2\).

The WHO-SEAR report states that CVD mortality in India in the 30–59 age group was twice than that in the U.S. and that nearly 52 per cent of CVD deaths in India occurred below the age of 70 years compared with 23 per cent in developed countries. CVDs will be the largest cause of death and disability in India by 2020\(^2\).

Kerala is the diabetes capital of India with a prevalence of diabetes as high as 20%-double the national average of 8%. In a large multi-centered study involving nearly 20,000 subjects, the prevalence of diabetes in Thiruvananthapuram was 17% compared to 15% in Hyderabad and New Delhi, 4% in Nagpur and 3% in Dibrugarh\(^2\).

The increase in cardiovascular morbidity and mortality appears to relate to the synergism of hyperglycemia with other cardiovascular risk factors. After controlling for all known cardiovascular risk factors, Type 2 DIABETES MELLITUS increases the cardiovascular death rate two folds in men and four fold in women. Risk factors of macro vascular disease in diabetic clients dyslipidemia, hypertension, obesity, reduced physical activity and cigarette smoking\(^3\).

The study conducted in seven villages of Kerala, analyzed the cause of 3411 deaths that occurred from 1996 to 2001 showed that 49% of deaths in community are due to cardiovascular diseases. Prevalence of risk factors is high even in rural Kerala. Diabetes 55%, high blood pressure 42%, high total cholesterol (>200mg/dl) 72%, smoking (42% in men) and obesity (BMI >25 kg/m\(^2\)) 40%, physical inactivity 41%,
unhealthy alcohol consumption 13%. Prevalence of heart disease in rural Kerala is 7%, which is nearly double that of North India.  

An ambitious project formulated by the Kerala State Health department with Population Health Research Institute (PHRI) of McMaster University Canada. The project was supervised and supported academically by Achutha Menon Centre for Health Science Studies, Health Action by People and Department of Community Medicine at Medical College Thiruvananthapuram. It was the largest Cohort Study conducted in the world to track out the morbidity and mortality pattern in the state through a survey covering 2.3 lakhs household or a population of 14,61,466 covering all Panchayat of Kerala.
NCD Control Program Screening Conducted By Kerala State Health Department With Population Health Research Institute Of Mc Master University 2012

Table 1

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Number of clients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of patient screened</td>
<td>14,61,466</td>
<td>100%</td>
</tr>
<tr>
<td>Number of newly detected Diabetes Mellitus</td>
<td>1,23,292</td>
<td>8.43%</td>
</tr>
<tr>
<td>Number of new detected Hypertension cases</td>
<td>1,58,379</td>
<td>10.83%</td>
</tr>
<tr>
<td>Number of newly detected Diabetes Mellitus and Hypertension</td>
<td>82,243</td>
<td>5.62%</td>
</tr>
<tr>
<td>Number of newly detected cancer cases</td>
<td>1237</td>
<td>0.08%</td>
</tr>
<tr>
<td>Number of new CVD Cases</td>
<td>3873</td>
<td>0.26%</td>
</tr>
</tbody>
</table>

Based on this findings, investigator consider the assessing the prevalence and awareness of cardiovascular morbidity risk factors in diabetic clients will be a cornerstone in the improvement of the cardiovascular status of diabetic clients.

**STATEMENT OF THE PROBLEM**

Study to assess the prevalence of risk factors of cardiovascular morbidity among patients with Diabetes Mellitus attending PHC Pangappara, Thiruvananthapuram.

**OBJECTIVES OF THE STUDY**

1. Assess the prevalence of risk factors of cardiovascular morbidity among patients with Diabetes Mellitus attending PHC Pangappara, Thiruvananthapuram.

2. Assess the awareness regarding risk factors of cardiovascular morbidity among patients with Diabetes Mellitus attending PHC Pangappara, Thiruvananthapuram.

**OPERATIONAL DEFINITIONS**

1) **RISK FACTORS**

   It is a variable associated with an increased risk of a disease.

   In this study, risk factors means risk factors of cardiovascular morbidity.

2) **CARDIOVASCULAR MORBIDITY**

   In this study, it is defined as condition of having cardiovascular disease.
3) PREVALENCE OF RISK FACTORS OF CARDIOVASCULAR MORBIDITY

In this study, the risk factors of cardiovascular morbidity that assessed are age, gender, total blood cholesterol, systolic blood pressure, smoking, physical activity and BMI using WHO ISH Risk Prediction Chart and Cardiovascular risk assessment format.

4) PATIENTS WITH DIABETES MELLITUS

It refers to patients already diagnosed with Type 2 Diabetes Mellitus by a qualified doctor, with a documented data.

ASSUMPTION

Risk factors of cardiovascular morbidity are prevalent among patients with Diabetes Mellitus

REVIEW OF LITERATURE

Literature review is the process of reading, analyzing, evaluating and summarizing scholarly materials about a specific topic. It is an essential component of research process.

The areas lighted up in this review are on

- Related literature regarding global spectrum of Diabetes Mellitus.
- Related literature regarding global spectrum of cardiovascular morbidity.
- Related literature regarding prevalence of cardiovascular morbidity in Type 2 Diabetes Mellitus.
• Related literature regarding the risk factors cardiovascular morbidity in Type 2 Diabetes Mellitus.

GLOBAL SPECTRUM OF DIABETES MELLITUS

Study conducted in Chengannur taluk of Kerala estimated the crude prevalence of Diabetes Mellitus as 12.5%, hypertension as 36.1%, hypercholesterolemia as 37% and central obesity as 85.6%.

Study conducted by University of Tokushima, Japan on the prevalence of diabetes and associated risk factors in Ho Chi Minh City, Vietnam revealed that age, gender-adjusted crude prevalence of diabetes and IFG were 6.6% and 3.2% respectively. It also indicated that ageing, high Waist Hip Ratio level, overweight and sedentary lifestyle are important determinants of increased prevalence of diabetes in Vietnam population.

A recent survey conducted by Metropolis Health Care, Mumbai, Maharashtra, found that epidemiology of diabetes is most affected in Mumbai than other cities of India. Plasma glucose abnormality was found to be highest compared to other cities. In other cities the plasma glucose abnormality was found to be higher in age group of above 55 years and next affected age group is 35-55 years. In Mumbai the abnormality was found same across all age groups which show there is early onset of Diabetes Mellitus.

Study conducted by University of Edinburg on Global Prevalence of Diabetes estimates for the year 2000 and projections for 2030, estimated that prevalence of diabetes for all age–groups world wide as 2.8% in 2000 and 4.4% in 2030. Total
number of people with diabetes is projected to rise from 171 million in 2000 to 366 million in 2030 \(^9\).

Study done in Rural Tamaka, Kolar regarding the prevalence and awareness regarding Diabetes Mellitus, found out that 10% of the sample had hyperglycemia. 75% of the samples were not aware of the long term effects of Diabetes Mellitus and diabetic care. Common perception about the diet in diabetes was to avoid sweets, rice and fruits and to consume more ragi, millet and wheat chapatti. It was found relevant knowledge about diabetes is poor in rural population \(^{10}\).

A multi-centric study conducted in Mumbai with 41000 Indian people has estimated that age and gender standardized prevalence of Diabetes Mellitus in India to be 3.3% \(^{11}\).

**GLOBAL SPECTRUM OF CARDIOVASCULAR MORBIDITY**

Study conducted in Hero DM Heart Institute, Ludhiana, on Effectiveness of BMI, WHR, and Past history of Illness on the Occurrence of Post Operative Complications among CABG Patients”, found that most common post-operative complications observed among CABG subjects include constipation(100%), weakness (100%), dysrrhythiams(98.3%), increased WBCs count(91.6%), dyspnea (75%), raised body temperature (73.3%), negative fluid balance (58.3%) tachypnea (46.7%), hypotension(45%), hyponatremia (38.3%), nausea (23.3%), pressure sores (13.3%), hypokalemia (10%), throat infection (5%), altered mental status(3.3%), urinary tract infection (3.3%), stroke (1.6%), pulmonary edema (1.6%), pleural effusion (1.6%). Hypertension and Diabetes Mellitus in past reported higher number of complications (34.2%) as compared to subjects who had either Diabetes Mellitus(28.5%) or hypertension (22.8%) \(^{12}\).
PREVALENCE OF CARDIOVASCULAR MORBIDITY IN TYPE 2 DIABETES MELLITUS

A study conducted in USA, revealed a marked increase in PAD, CHF, CHD, MI, and sudden death (risk increase from one-to five fold ) in Diabetes Mellitus. The American heart Association has designated Diabetes Mellitus as a CHD risk equivalent. Type 2 Diabetes Mellitus patients without a prior MI had a similar risk for coronary artery–related events as non diabetic individuals who had a prior MI because there is extreme high prevalence of underlying CVD in individuals with Diabetes Mellitus (especially type 2 Diabetes Mellitus). The absence of chest pain (‘silent ischemia”) is common in individuals with Diabetes Mellitus. In Type 2 Diabetes Mellitus clients CHD involve multiple vessels, after controlling all known cardiovascular risk factors , Type 2 Diabetes Mellitus increases the cardiovascular death rate by 2 fold in men, and 4 fold in women \(^{13}\).

PREVALENCE OF RISK FACTORS CARDIOVASCULAR MORBIDITY IN TYPE 2 DIABETES MELLITUS

Framingham heart study conducted in USA, estimated that risk factors for macrovascular disease in Diabetes Mellitus patients include dyslipidemia, hypertension, obesity, reduced physical activity and cigarette smoking. Additional risk factors included, micro albuminuria, macro albuminuria, elevated serum creatinine, abnormal platelet function. \(^{13}\)

Study conducted in Brazil estimated that in both genders, Diabetes Mellitus increased the risk for CHD(hazard ratio 1.99 and 2.93 for men and women, respectively). Diabetic men and women had a 10-year cumulative incidence of CHD
of 25.9 and 19.1%, respectively, compared with 57.4 and 58.4% for non diabetic men and women with previous CHD\textsuperscript{14}.

Study done on to evaluate the effect of progression from impaired glucose tolerance to Diabetes on cardiovascular risk factors and its amelioration by lifestyle and metformin intervention in Sweden estimated the longitudinal relationship between selected CVD risk factors (blood pressure, triglycerides, HDL and LDL cholesterol, and LDL peak particle density [PPD]) and glycemia in the three treatment groups of the Diabetes Prevention Program\textsuperscript{15}.

RESEARCH METHODOLOGY

RESEARCH APPROACH

Research approach used was quantitative which had descriptive aspect and emphasize upon structured and objective measuring procedures.

RESEARCH DESIGN

Research design incorporates the most important methodological decisions that researcher made. Research design links the investigator’s abstract thinking about a topic with the realities of studying topics.

A cross sectional design was used in this study to estimate the prevalence of risk factors of cardiovascular morbidity in Type 2 Diabetes Mellitus patients. It involve the collection of data once the phenomenon under study is captured during one period of data collection. This design allows interviewing the Type2 Diabetic Mellitus patients to identify the prevalence and awareness of risk factors of
cardiovascular morbidity in them, sometimes serves as a starting point for hypothesis generation or theory development.

VARIABLES

An attribute that varies, i.e., takes on different values. In most of the research studies, researcher made an attempt to study the sample characteristics and present them in research findings. In addition sometimes researcher even try to establish relations of demographic variables with research variables.

Research Variables: Prevalence and awareness of risk factors Cardiovascular risk morbidity among Patients with Type2 Diabetes Mellitus.

Demographic data includes age, gender, residence, religion, family, marital status, socio economic status, dietary habits, unhealthy habits.

SETTING OF THE STUDY

In the study setting was Out Patient Department of Primary Health Centre Pangappara, Thiruvananthapuram

POPULATION

A population is the entire set of individuals (or objects) having some common characteristics. In this study, population referred to patients with Type 2 Diabetes Mellitus residing under jurisdiction of Primary Health Centre Pangappara, Thiruvananthapuram.

SAMPLE, SAMPLING TECHNIQUE
Sample is a portion of population selected for observation and analysis. Sampling is the process of selecting a portion of the population to represent the entire population. Sampling is necessary because it is more economical and efficient to work with a small group.

**SAMPLE SIZE**

Sample size is calculated using the formula: \( n = \frac{4pq}{d^2} \)

\[ p = 21 \quad q = (100-21) = 79 \quad d = 20\% \text{ of } p \]

\[ N = \frac{4 \times 0.21 \times 0.79}{(0.2 \times 0.21)^2} \]

\[ N = 376 \]

(According to the study “High prevalence of Type2 Diabetes Mellitus and Other Metabolic Disorders in Rural central Kerala” by G Vijayakumar, R Arun and V R Kutty 2007 Obesity 21.4%, hypertension 25.9%, Hypercholesterolemia 23.4%).

**SAMPLING TECHNIQUE**

Samples were selected consecutively from the Out Patient Department of Primary Health Centre Pangappara during the study period.

All the patients satisfying the inclusion criteria were selected for the study.

**INCLUSION CRITERIA**

1) Patients who are diagnosed with Type 2 Diabetes Mellitus by a qualified doctor and with a documented data attending Out Patient Department of Primary Health Centre Pangappara, Thiruvananthapuram during the study period.

2) Patients who are ready to give information regarding questions asked.
EXCLUSION CRITERIA

1) Patients with Diabetes Mellitus already diagnosed with cardiovascular disease

2) Patients diagnosed with type 1 Diabetes Mellitus

TOOL AND TECHNIQUES

TOOL/ INSTRUMENTS

Tools are devices or instruments utilized to collect data. In this study, an interview schedule and WHO-ISH Risk Prediction Chart were employed for collecting data from Type2 Diabetes Mellitus patients residing in the area under Primary Health Centre Pangappara, Thiruvananthapuram attending the Out Patient Department during the study period.

TECHNIQUE

Technique is the method by which data are collected. In this study the following techniques were used.

1. INTERVIEW: Interview was conducted with the help of an interview schedule for assessing the awareness regarding risk factors of cardiovascular morbidity in patients with Type 2 Diabetes Mellitus.

2. CARDIOVASCULAR RISK FACTOR ASSESSMENT FORMAT: was used to assess the BMI, Blood Pressure, Lipid Profile, Physical Activity in Type2 Diabetes Mellitus patients.

3. WHO-ISH RISK PREDICTION CHART: was used to assess the 10 year risk of a fatal or non-fatal cardiovascular events in patients with Type2 Diabetes Mellitus based on the age, gender, systolic blood pressure, total blood cholesterol and smoking status.
DEVELOPMENT / SELECTION OF THE TOOL

The research tool was devised on the basis of related literature and under the guidance of subject experts in the field of nursing, community, medicine, statistics.

DESCRIPTION OF THE TOOL

The tool consists of four sections.

SECTION I

CARDIOVASCULAR DISEASE RISK FACTOR ASSESSMENT FORMAT AND WHO-ISH RISK PREDICTION CHART

It helped to estimate the 10 year risk of a fatal or non-fatal cardiovascular events in patients with Type2 Diabetes Mellitus based on the age, gender, systolic blood pressure, total blood cholesterol and smoking status.

SECTION II

INTERVIEW SCHEDULE – deals with estimating the awareness regarding risk factors of cardiovascular morbidity in patients with Type 2 Diabetes Mellitus. The known risk factors of cardiovascular morbidity discussed are heredity, smoking, diet, cholesterol, hypertension, exercise and obesity.

CONTENT VALIDITY

The research tool was prepared on the basis of review of related literature and under the guidance of subject experts. The content validity of the tool was checked by subject experts.
from Community Medicine, Community Health Nursing, Medicine, and Statistics department. Based on their valuable suggestions the tool attained its final form.

**RELIABILITY OF THE TOOL**

The reliability of the tool was checked after pilot study using split half technique i.e., Correlation coefficient (r) = 0.87.

**DATA COLLECTION PROCESS**

The data collection period was six weeks (6-1-2014 to 15-2-2014). The investigator obtained prior permission to conduct the study from Institutional Human Ethics Committee, Research Committee and Administrative Medical Officer of Primary Health Centre Pangappara, Thiruvananthapuram. Study participants were selected consecutively as they come to the Out Patient Department of Primary Health Centre Pangappara, Thiruvananthapuram.

The participants were explained about the study and purpose of the study. Verbal and written consent were obtained from the participants prior to data collection. Face to face interview was conducted to collect data regarding the socio demographic variables, clinical data and to assess the awareness regarding risk factors of cardiovascular morbidity among patients with Type 2 Diabetes Mellitus attending Out Patient Department of Primary Health Centre Pangappara, Thiruvananthapuram. With standardized stadiometer and standardized weighing machine height and weight were measured. BMI was calculated with the formula weight(kg)/ height (m²). Standardized sphygmomanometer was used to measure the blood pressure, lipid profile values from laboratory in Primary Health Centre Pangappara was accepted. WHO- ISH Risk Prediction chart was used for estimating the 10 year risk of a fatal
or non-fatal cardiovascular events in patients with Type2 Diabetes Mellitus which was based on the age, gender, systolic blood pressure, total blood cholesterol and smoking status.

It was assured to participants that all data collected would be kept strictly confidential and used only for the study purpose.

**DATA ANALYSIS**

The collected data were coded, organized and entered in Microsoft excel and analyzed by using Statistical package for Social Sciences (SPSS version -16). The prevalence was estimated by percentage(%). Chi-square test and odds ratio was used to find out the association between prevalence of risk factors of cardiovascular morbidity among patients with Type2 Diabetes Mellitus with selected variables. Chi-square test was used to find out the association between awareness of risk factors of cardiovascular morbidity among Type2 Diabetes Mellitus patients with selected variables.
ANALYSIS AND INTERPRETATION

Findings are presented below under the following headings

Section I - Prevalence of risk factors of cardiovascular morbidity among Type2 Diabetes Mellitus patients using WHO ISH Risk Prediction Chart.

Section II - Awareness regarding risk factors of cardiovascular morbidity among patients with Type2 Diabetes Mellitus.

FIGURE 1

DISTRIBUTION OF SUBJECTS ACCORDING TO PREVALENCE OF CARDIOVASCULAR RISK FACTOR (WHO ISH RISK PREDICTION CHART)

(n=376)

In the figure 1, showed that 70.5% of the subjects had <30%, 29.5% of the subjects had ≥30% prevalence of risk factors of cardiovascular morbidity in patients with Type2 Diabetes Mellitus.
TABLE 2 ASSOCIATION OF AGE, GENDER, SOCIO ECONOMIC STATUS, DIETARY HABITS AND PHYSICAL ACTIVITY WITH RISK FACTORS OF CARDIOVASCULAR MORBIDITY USING WHO RISK PREDICTION CHART (N = 376)

<table>
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<tr>
<th>Sl no</th>
<th>Variables</th>
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<th></th>
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<tbody>
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<td></td>
<td></td>
<td>High risk (N=181)</td>
<td>Low risk (N=195)</td>
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<tr>
<td></td>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>1</td>
<td>Age in years</td>
<td>&gt;60</td>
<td>133</td>
<td>73.5</td>
<td>46</td>
<td>23.6</td>
<td>93.675</td>
<td>&lt;0.001</td>
<td>8.975</td>
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<td></td>
<td></td>
<td>&lt;60</td>
<td>48</td>
<td>26.5</td>
<td>149</td>
<td>76.4</td>
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<td></td>
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<tr>
<td>2</td>
<td>Gender</td>
<td>Male</td>
<td>72</td>
<td>39.8</td>
<td>35</td>
<td>17.9</td>
<td>21.973</td>
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<tr>
<td>3</td>
<td>Socio Economic Status</td>
<td>Lower</td>
<td>111</td>
<td>61.3</td>
<td>112</td>
<td>57.4</td>
<td>0.589</td>
<td>0.443</td>
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<td></td>
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<td>Middle/ higher</td>
<td>70</td>
<td>38.7</td>
<td>83</td>
<td>42.6</td>
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<td>4</td>
<td>Dietary Habits</td>
<td>Vegetarian</td>
<td>18</td>
<td>9.9</td>
<td>21</td>
<td>10.8</td>
<td>0.069</td>
<td>0.793</td>
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<td>Non vegetarian</td>
<td>163</td>
<td>90.1</td>
<td>174</td>
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<tr>
<td>5</td>
<td>Physical Activity</td>
<td>Vigorous activity</td>
<td>23</td>
<td>12.7</td>
<td>21</td>
<td>10.8</td>
<td>1.973</td>
<td>0.373</td>
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<td></td>
<td></td>
<td>Moderate activity</td>
<td>149</td>
<td>82.3</td>
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<td>86.7</td>
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<td>Sedentary</td>
<td>9</td>
<td>5</td>
<td>5</td>
<td>2.6</td>
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</table>

* not significant.

The table 2 showed that age and gender are statistically significant at 0.05 level.
Table 3 showed that total cholesterol, unhealthy habits, duration of illness and BP are statistically significant at 0.05 level.

<table>
<thead>
<tr>
<th>Sl No</th>
<th>WHO risk factors</th>
<th>N</th>
<th>%</th>
<th>N</th>
<th>%</th>
<th>χ²</th>
<th>P</th>
<th>OR 95%CI</th>
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<tr>
<td>1</td>
<td>Total Cholesterol</td>
<td>&gt;240</td>
<td>107</td>
<td>59.1</td>
<td>51</td>
<td>26.2</td>
<td>41.862</td>
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<td>&lt;240</td>
<td>74</td>
<td>40.9</td>
<td>144</td>
<td>73.8</td>
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<td>2</td>
<td>Unhealthy habits</td>
<td>Present</td>
<td>74</td>
<td>40.9</td>
<td>34</td>
<td>17.4</td>
<td>25.209</td>
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<td>Absent</td>
<td>107</td>
<td>59.1</td>
<td>161</td>
<td>82.6</td>
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<td>Duration of illness</td>
<td>&gt;10 years</td>
<td>70</td>
<td>38.7</td>
<td>55</td>
<td>28.2</td>
<td>4.636</td>
<td>0.031</td>
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<td></td>
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<td>&lt;10 years</td>
<td>111</td>
<td>61.3</td>
<td>140</td>
<td>71.8</td>
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<td>52</td>
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<td></td>
<td></td>
<td>Average</td>
<td>65</td>
<td>35.9</td>
<td>80</td>
<td>41</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Good</td>
<td>70</td>
<td>38.7</td>
<td>63</td>
<td>32.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>BMI</td>
<td>Over weight/Obese</td>
<td>91</td>
<td>50.3</td>
<td>87</td>
<td>44.6</td>
<td>1.207</td>
<td>0.272</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Normal</td>
<td>90</td>
<td>49.7</td>
<td>108</td>
<td>55.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>BP</td>
<td>Abnormal</td>
<td>163</td>
<td>90.1</td>
<td>121</td>
<td>62.1</td>
<td>39.832</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Normal</td>
<td>18</td>
<td>9.9</td>
<td>74</td>
<td>37.9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* not significant.
There was a statistical significance between age and WHO risk factors of cardiovascular morbidity (p<0.001), $\chi^2 = 93.675$ and Odds Ratio = 8.975. (95% CI-lower 5.626 and upper 14.319)

Gender has statistical significance on the WHO risk factors of cardiovascular morbidity (p < 0.001), $\chi^2 = 21.973$ and Odds Ratio = 3.02. (95% CI-lower 1.884 and upper 4.839)

Total cholesterol has significant association between Who Risk factors cardiovascular morbidity $\chi^2 = 41.862$, p =<0.001 and odds ratio = 4.083. (95%CI- lower 2.641 and upper 6.312)

There was significant association of between the unhealthy habits (alcoholism, smoking, chewing, snuffing, smoking and alcoholism) and WHO risk factors of cardiovascular morbidity $\chi^2 = 25.209$ p=<0.001 odds ratio= 3.275. (95%CI- lower 2.039 and upper 5.261)

Findings show that there is statistical significance between duration of illness and WHO risk factors of cardiovascular morbidity $\chi^2 = 4.636$, p<0.03 and odds ratio= 1.605. (95%CI- lower 1.042 and upper 2.473)

The study proved a significant statistical association between BP and development of risk factors of cardiovascular morbidity $\chi^2 = 39.832$ (p < 0.001) and odds ratio =5.538 (95%CI –lower 3.144 and upper 9.756)
SECTION II

This section deals with data regarding awareness about risk factors of cardiovascular morbidity in patients with Type2 Diabetes Mellitus was represented by percentage. The findings are presented as follows

FIGURE 2

DISTRIBUTION OF SUBJECTS ACCORDING TO AWARENESS ABOUT RISK FACTORS OF CARDIOVASCULAR MORBIDITY IN PATIENTS WITH TYPE2 DIABETES MELLITUS

(n= 376)

In the figure 2 showed, 38.6% of the subjects had average awareness, 35.4% of the subjects had good awareness and 26% of the subjects had poor awareness regarding risk factors of cardiovascular morbidity among patients with Type2 Diabetes Mellitus.
TABLE 4   ASSOCIATION OF AGE, GENDER, SES, PHYSICAL ACTIVITY, TOTAL CHOLESTEROL, BP AND BMI WITH AWARENESS OF RISK FACTORS OF CARDIOVASCULAR MORBIDITY IN PATIENTS WITH TYPE2 DIABETES MELLITUS  
(n = 376)

<table>
<thead>
<tr>
<th>Sl no</th>
<th>Variables</th>
<th>Awareness</th>
<th>( \chi^2 )</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Poor  N</td>
<td>%</td>
<td>Good N</td>
</tr>
<tr>
<td>1</td>
<td>Age</td>
<td>&gt;60 122</td>
<td>68.2</td>
<td>57 31.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt;60 121</td>
<td>61.4</td>
<td>76 38.6</td>
</tr>
<tr>
<td>2</td>
<td>Gender</td>
<td>Male 70</td>
<td>65.4</td>
<td>37 34.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Female 173</td>
<td>64.3</td>
<td>96 35.7</td>
</tr>
<tr>
<td>3</td>
<td>SES</td>
<td>Lower 134</td>
<td>60.1</td>
<td>89 39.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Middle or higher 109</td>
<td>71.2</td>
<td>44 28.8</td>
</tr>
<tr>
<td>4</td>
<td>Physical activity</td>
<td>Vigorous activity 36</td>
<td>81.8</td>
<td>8 18.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Moderate activity 199</td>
<td>62.6</td>
<td>119 37.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sedentary 8</td>
<td>57.1</td>
<td>6 42.9</td>
</tr>
<tr>
<td>5</td>
<td>Total cholesterol</td>
<td>&gt;240 93</td>
<td>58.9</td>
<td>65 41.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt;240 150</td>
<td>68.8</td>
<td>68 31.2</td>
</tr>
<tr>
<td>6</td>
<td>BP</td>
<td>Abnormal 184</td>
<td>64.8</td>
<td>100 35.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Normal 59</td>
<td>64.1</td>
<td>33 35.9</td>
</tr>
<tr>
<td>7</td>
<td>BMI</td>
<td>Normal 134</td>
<td>67.7</td>
<td>64 32.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pre Obese 83</td>
<td>61.9</td>
<td>51 38.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Obese Class I 21</td>
<td>55.3</td>
<td>17 44.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Obese Class II 5</td>
<td>83.3</td>
<td>1 16.7</td>
</tr>
</tbody>
</table>

The table 4 showed that socioeconomic status, physical activity and total cholesterol have statistical significant at 0.05 level.
TABLE 5 ASSOCIATION OF MARITAL STATUS, FAMILY, DIETARY HABITS, SYSTEM OF TREATMENT, UNHEALTHY HABITS AND DURATION OF ILLNESS WITH AWARENESS ABOUT RISK FACTORS OF CARDIOVASCULAR MORBIDITY AMONG TYPE2 DIABETES MELLITUS PATIENTS (n=376)

<table>
<thead>
<tr>
<th>Sl no</th>
<th>Variables</th>
<th>Awareness</th>
<th>$\chi^2$</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Poor</td>
<td>Good</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
</tr>
<tr>
<td>1</td>
<td>Martial Status</td>
<td>Married</td>
<td>190 63.5</td>
<td>109 36.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Others</td>
<td>53 68.8</td>
<td>24 31.2</td>
</tr>
<tr>
<td>2</td>
<td>Type of Family</td>
<td>Joint family</td>
<td>59 69.4</td>
<td>26 30.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nuclear family</td>
<td>184 63.2</td>
<td>107 36.8</td>
</tr>
<tr>
<td>3</td>
<td>Dietary Habits</td>
<td>Vegetarian</td>
<td>29 74.4</td>
<td>10 25.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Non vegetarian</td>
<td>214 63.5</td>
<td>123 36.5</td>
</tr>
<tr>
<td>4</td>
<td>System of Treatment</td>
<td>Allopathy</td>
<td>221 63.5</td>
<td>127 36.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Allopathy, Ayurveda</td>
<td>22 78.6</td>
<td>6 21.4</td>
</tr>
<tr>
<td>5</td>
<td>Unhealthy Habits</td>
<td>Present</td>
<td>75 69.4</td>
<td>33 30.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Absent</td>
<td>168 62.7</td>
<td>100 37.3</td>
</tr>
<tr>
<td>6</td>
<td>Duration of Illness</td>
<td>&gt;10 years</td>
<td>75 60</td>
<td>50 40</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt;10 years</td>
<td>168 66.9</td>
<td>83 33.1</td>
</tr>
</tbody>
</table>

The table 5 shows there exist no statistical association between marital status, family, dietary habits, system of treatment, unhealthy habits and duration of illness with awareness about risk factors of cardiovascular disease at 0.05 level.
There existed no statistical significance between age and awareness risk factors of cardiovascular morbidity in Type 2 Diabetes Mellitus patients.

\[ \chi^2 = 1.861, \ p = 0.173 \]

Gender had no statistical significance with awareness risk factors of cardiovascular morbidity in Type 2 Diabetes Mellitus patients \[ \chi^2 = 0.041, \ p = 0.839 \].

Findings showed that there was statistical significance between socioeconomic status and awareness of risk factors of cardiovascular morbidity in Type 2 Diabetes Mellitus patients \[ \chi^2 = 4.937, \ p = 0.026 \].

Physical activity had statistical significant association with awareness of risk factors cardiovascular morbidity in Type 2 Diabetes Mellitus patients \[ \chi^2 = 6.615, \ p = 0.037 \].

There was significant association of between the total cholesterol and awareness of risk factors of cardiovascular morbidity in Type 2 Diabetes Mellitus patients \[ \chi^2 = 3.965, \ p = 0.046 \].

The study proved no significant statistical association between BP and awareness of risk factors of cardiovascular morbidity in Type 2 Diabetes Mellitus patients \[ \chi^2 = 0.013, \ p = 0.909 \].

There exists no statistical significance between BMI and awareness risk factors of cardiovascular morbidity in Type 2 Diabetes Mellitus patients.

\[ \chi^2 = 3.605, \ p = 0.307 \]

Association with awareness of risk factors of cardiovascular morbidity was checked with the other selected variables ie, marital status(\[ \chi^2 = 0.748, \ p = 0.387 \]), type of family(\[ \chi^2 = 1.100, \ p = 0.294 \]), dietary habits(\[ \chi^2 = 1.803, \ p = 0.179 \]), system of
treatment($\chi^2=2.573$, $p=0.109$), duration of illness($\chi^2=1.754$, $p=0.185$) and unhealthy habits($\chi^2=1.538$, $p=0.215$)

**DISCUSSION**

The study focused on the assessment of the prevalence and awareness of risk factors of cardiovascular morbidity among patients with Type2 Diabetes Mellitus attending Out Patient Department of Primary Health Centre Pangappara, Thiruvananthapuram. Based on the findings of the study, investigator arrived at the following conclusions regarding the prevalence and awareness of risk factors of cardiovascular morbidity among patients with Type2 Diabetes Mellitus.

A) The prevalence of risk factor of cardiovascular morbidity in patients with Type2 Diabetes Mellitus was calculated using WHO ISH Risk Prediction Chart, and the investigator found 70.5% of the subjects had <30% cardiovascular risk were included in the high risk group, 29.5% of the subjects had ≥ 30% cardiovascular risk were included in the low risk group.

Results showed that age, gender, total cholesterol, unhealthy habits, duration of illness and BP had statistical significance at 0.05 level in development of fatal or nonfatal cardiovascular events in the next 10 years.

1. 73.5% of subjects in the high risk group were >60 years of age and 76.4% of subjects in low risk group were <60 years of age

a) It was found that as age increases above sixty years risk for cardiovascular morbidity increases by eight times.
2. 82.1% among low risk group and 60.2% among high risk were females. Finding revealed that females over represented the results (71.5% of the total sample were females).

- Males had three times more risk for developing cardiovascular diseases than females with Type 2 Diabetes Mellitus.

3) Among 376 patients, 58.1% belonged to class IV, 37.8% belonged to class III, 2.7% belonged to class II, 1.1% belonged to class V and 0.3% belonged to class I

b) Low socioeconomic status was related to increased risk of cardiovascular morbidity in patients with Type 2 Diabetes Mellitus.

4) 40.9% of subjects among high risk group and 17.4% within the low risk group were following unhealthy habits especially smoking (10.6%) and alcoholism (1.9%).

d) It revealed that presence of unhealthy habits rise the risk of cardiovascular disease by three times

5) Subjects with >240 mg/dl total cholesterol had 59.1% chance for high risk were as 73.8% categorized in low risk group had total cholesterol <240 mg/dl and it was inferred that total cholesterol above 240 mg/dl rise the risk of cardiovascular morbidity by 4 times.

6) Studies revealed that 38.7% of subjects in high risk category (where diabetic for greater than 10 years) and 61.3% in high risk were diabetic for less than 10 years and found that as duration of illness increases subjects became more aware about complications. Moreover, they followed, treatment and lifestyle modification effectively to prevent complications.

It was estimated that 90.1% among the high risk group and 62.1% among low risk group had BP above 140/90 mm Hg. In showed that 75.5% of subjects included in the current
study had abnormal BP (above 140/90 mm Hg) found that increase in BP above 140/90 mm Hg irrespective of the age increased the chance of development of fatal and non fatal cardiovascular events in the next 10 years by five times). The present study, revealed 38.6% of the subjects had average awareness, 35.4% of the subjects had good awareness and 26% of the subjects had poor awareness regarding risk factors of cardiovascular among type2 Diabetes Mellitus patients.

1) In the current study it was found that socioeconomic status, physical activity and total cholesterol had significant statistical association at 0.05 level with awareness about risk factors of cardiovascular morbidity in patients with type2 Diabetes Mellitus.

2) 59.3% of subjects belonged to lower socioeconomic status and 40.7% belonged to high socioeconomic status.

3) 60.1% of subjects among the lower socioeconomic status had poor awareness whereas 39.9% belonged to lower socioeconomic status had good awareness regarding risk factors of cardiovascular morbidity in patients with type2 Diabetes Mellitus.

4) 71.2% of subjects included in middle/high socioeconomic status had poor awareness whereas 28.8% among middle/high socioeconomic status had good awareness regarding risk factors of cardiovascular morbidity among type2 Diabetes Mellitus patients.

5) It was revealed that low socioeconomic status was found to be related to awareness of risk factors of cardiovascular morbidity in patients with Type2 Diabetes Mellitus.

5) 11.7% of subjects are involved in vigorous activity, 84.5% performed moderate activity and 0.03% followed sedentary habits.

6) 81.8% of the subjects involved in vigorous activity, 62.6% performed moderate activity and 57.1% followed sedentary habits had poor awareness regarding risk factors of cardiovascular among type2 Diabetes Mellitus patients.

7) 18.2% of subjects involved in vigorous activity, 37.4% performed moderate activity and
42.9% followed sedentary habits had good awareness regarding risk factors of cardiovascular among type2 Diabetes Mellitus patients.

f) It found that Type2 Diabetes Mellitus patients involved in moderate activity had good awareness compared to subjects performing vigorous activity and sedentary habits.

8) 42.1% of the subjects in the study had total cholesterol > 240 mg/dl and 57.9% had total cholesterol < 240 mg/dl.

9) 58.9% of subjects belonged to group (> 240 mg/dl) and 68.8% of subjects involved in group (< 240 mg/dl) had poor awareness.

10) 41.1% of subjects included in > 240 group and 31.2% of subjects among < 240 group had poor awareness.

g) It showed that Subjects with total cholesterol greater than 240 mg/dl had good awareness compared to subjects less than 240 mg/dl.

CONCLUSION

The study focused on the estimation of prevalence and awareness of risk factors of cardiovascular morbidity among patients with Type2 Diabetes Mellitus attending Primary Health Centre Pangappara, Thiruvananthapuram. Based on the findings of the study the conclusions drawn were as follows.

- As age increases above sixty years risk for cardiovascular morbidity increases by eight times.
- Males had 3 times more risk for developing cardiovascular diseases than females with Type 2 Diabetes Mellitus.
- Presence of unhealthy habits (smoking, alcoholism) rises the risk of cardiovascular disease by three times.
• Total cholesterol above 240 mg/dl rises, the risk of cardiovascular morbidity by four times.

• As duration of illness increases subjects became more aware about complications of Type2 Diabetes Mellitus. More over they followed treatment and lifestyle modification effectively to prevent complications.

• Increase in BP above 140/90 mm Hg, irrespective of the age increased the chance of development of fatal and non fatal cardiovascular events in the next 10 years by five times.

• Low socioeconomic status was found to be related with increased risk of cardiovascular morbidity in patients with Type2 Diabetes Mellitus.

• According to WHO ISH Risk Prediction Chart, BMI had no relation the development of cardiovascular disease. The findings of the current study supported these statement.

• Low socioeconomic status was found to be related to increased awareness of risk factors of cardiovascular morbidity in patients with Type2 Diabetes Mellitus.

• Type2 Diabetes Mellitus patients involved in moderate activity had good awareness compared to subjects performing vigorous activity and sedentary habits.

• Patients with Type2 Diabetes Mellitus with total cholesterol greater than 240 mg/dl had good awareness compared to subjects less than 240mg/dl

**NURSING IMPLICATIONS**

The findings of the study had a lot of implications in the field of community health nursing service, nursing education, nursing research and nursing administration. The risk factors of cardiovascular morbidity in Type2 Diabetes Mellitus can be assessed using WHO ISH Risk Prediction Chart and the consequences of illness can be prevented, treated and controlled more effectively. There exist a significant gap in
the public’s knowledge, attitudes and behaviors regarding the risk factors. The nurses as health care practitioners are able to make significant contributions in the prevention of risk factors, early identification of risk factors of cardiovascular morbidity can be done utilizing WHO ISH Risk Prediction Chart in patients with Type2 Diabetes Mellitus. It also helps nurses in imparting awareness and guidance for the subjects with known risk factors of Diabetes Mellitus.

NURSING SERVICE

1. The study findings can be used by the nurses of all field, as they can make significant contributions to cardiovascular disease control activities.

2. Community health nurses can conduct health education campaign for public regarding the importance of exercise, healthy habits, control of BP, blood sugar and blood cholesterol to normal value.

3. Community health nurses can utilize the WHO ISH Risk Prediction Chart to the identified risk factors of cardiovascular morbidity in patients with Type2 Diabetes Mellitus.

4. The information from the study can be utilized by nurses of all fields, public health nurses, mass media wings, health information centers and health educators to make their awareness programme more fruitful.

NURSING EDUCATION

Findings from the study can be utilized by the nurses of all fields and public health nurses to train health workers and nursing trainees to conduct health education activities through various means to control cardiovascular disease.

1 Nursing educators can utilize these study findings to teach students regarding cardiovascular problems during their medical surgical nursing classes.

2 The nursing personnel working in various health settings should be given in-service
education regarding the alarming rise of cardiovascular problems and to effectively use the WHO ISH Risk Prediction Chart to screen the patients with Diabetes Mellitus for early identification of risk factors.

3 Study findings can be used to train the frontline workers like multipurpose workers regarding the screening for risk factors of cardiovascular morbidity, using WHO ISH Risk Prediction Chart in patients with Type2 Diabetes Mellitus during their field visits.

**NURSING ADMINISTRATION**

1) Nurses can be involved in formulating the policy for short and long term health education in various settings regarding prevention of risk factors of cardiovascular morbidity in Type2 Diabetes Mellitus patients.

2) Nurse administrators should take initiative to conduct in-service education programs for nurses, multi purpose workers and motivate them to participate in such activities. It is necessary to select and train personnel to prepare appropriate teaching aid for prevention of risk factors of cardiovascular morbidity in Type2 Diabetes Mellitus patients and thus to reduce the burden of cardiovascular disease in the society.

3) Nurse Administrators can utilize these findings to plan health camps, NCD clinics and public awareness programmes on prevention of risk factors of cardiovascular morbidity in Type2 Diabetes Mellitus patients and change the faulty life style practices.

**NURSING RESEARCH**

1) The present study can be utilized by the subsequent researchers for their reference.

2) The same study can be a motivation to beginning researchers.

3) The suggestions and recommendations arising from the present study could be used for the beginning researchers in the same field.
4) The abstract of present study can be published in nursing journals, so that further
research regarding the known risk factors of cardiovascular morbidity in Type 2
Diabetes Mellitus patients can be encouraged.

LIMITATIONS

The study had some limitations despite every effort taken by the investigator to make it
more reliable and valid. They are:

1. Study was limited to semi-urban area of Thiruvananthapuram Corporation.
2. Due to limited data collection period, the sample size was restricted to 376.
3. Diet and nutritional factors were assessed by conducting a participant interview and
   there were no observational methods employed for assessing real dietary practices,
4. Modifiable risk factors like stress, LDL, HDL, VLDL were not included in the study.

RECOMMENDATIONS

In the light of the findings of the study, the following recommendations are put forth.

1. A similar study can be replicated on a large scale in different setting to ensure
   generalizability of the present study.
   Faulty lifestyle pattern (sedentary habits, fatty fried foods, lack of exercise) were
   the major risk factor prevalent in this study. Encouraging the public to follow a
   healthy lifestyle can be achieved by education, advocacy and legislation. Generating
   awareness on risk factors of cardiovascular morbidity in patients with Type2
   Diabetes Mellitus.

2. A mass media awareness program about the importance of practicing a healthy life
   style and periodic medical checkup for patients with Type2 Diabetes Mellitus can be
   conducted.

3. Community health services to be strengthened with greater participation in non
   communicable disease control program and to bridge the gap between prevention
early detection and treatment of risk factors cardiovascular morbidity in patients with Type2 Diabetes Mellitus.

4. The health education booklet regarding the prevention of risk factors of cardiovascular morbidity in patients with Type 2 Diabetes Mellitus can be prepared.

5. Appoint a nurse in the NCD clinic who have expertise in the early identification of risk factors cardiovascular morbidity in patients with Type 2 Diabetes Mellitus.

REFERENCES


