A CROSS-SECTIONAL STUDY TO ASSESS THE OUT-OF-POCKET EXPENDITURE ON DIABETES MELLITUS AMONG THE URBAN POPULATION OF THOOTHUKUDI DISTRICT, TAMILNADU, INDIA – 2016

Dissertation submitted to

THE TAMIL NADU Dr. MGR MEDICAL UNIVERSITY

In partial fulfilment of the requirements for the degree of

M.D. BRANCH XV

COMMUNITY MEDICINE

THE TAMIL NADU Dr. MGR MEDICAL UNIVERSITY,

CHENNAI, TAMIL NADU.

APRIL 2017

CERTIFICATE OF THE GUIDE

This is to certify that the dissertation titled "**A CROSS-SECTIONAL STUDY TO ASSESS THE OUT-OF-POCKET EXPENDITURE ON DIABETES MELLITUS AMONG THE URBAN POPULATION OF THOOTHUKUDI DISTRICT, TAMILNADU, INDIA – 2016"** is a bonafide work carried out by **Dr. GRACY PAULIN. D.**, Post Graduate student in the Institute of Community Medicine, Madras Medical College, Chennai-3, under my supervision and guidance towards partial fulfilment of the requirements for the degree of M.D. Branch XV Community Medicine and is being submitted to The Tamil Nadu Dr. M.G.R. Medical University, Chennai.

Signature of the Guide

Dr. JOY PATRICIA PUSHPARANI, M.D.,
Professor,
Institute Of Community Medicine,
Chennai- 600 003.

CERTIFICATE

This is to certify that the dissertation titled "**A CROSS-SECTIONAL STUDY TO ASSESS THE OUT-OF-POCKET EXPENDITURE ON DIABETES MELLITUS AMONG THE URBAN POPULATION OF THOOTHUKUDI DISTRICT, TAMILNADU, INDIA – 2016"** is a bonafide work carried out by**Dr. GRACY PAULIN. D.**, Post Graduate student in the Institute of Community Medicine, Madras Medical College, Chennai-3, under the guidance of **Dr. JOY PATRICIA PUSHPARANI, M.D.,** towards partial fulfilment of the requirements for the degree of M.D. Branch XV Community Medicine and is being submitted to The Tamil Nadu Dr. M.G.R. Medical University, Chennai.

Dr. M.K. MURALITHARAN, M.S., M.Ch.,
Dean,
Madras Medical College,
Chennai -600 003

Dr. T.S. SELVA VINAYAGAM, M.D., D.P.H., D.N.B.,
Director,
Institute of Community Medicine
Madras Medical College,
Chennai- 600 003

DECLARATION

I, solemnly declare that the dissertation titled "**A CROSS-SECTIONAL STUDY TO ASSESS THE OUT-OF-POCKET EXPENDITURE ON DIABETES MELLITUS AMONG THE URBAN POPULATION OF THOOTHUKUDI DISTRICT, TAMILNADU, INDIA – 2016",** was done by me under the guidance and supervision of **Dr. JOY PATRICIA PUSHPARANI, M.D.,** Professor, Institute of Community Medicine, Madras Medical College, Chennai-3. The dissertation is submitted to The Tamil Nadu Dr. M.G.R. Medical University towards the partial fulfilment of the requirement for the award of M.D. degree (Branch XV) in Community Medicine.

Place: Chennai

Signature of the candidate

Date:

(Dr. Gracy Paulin. D.)

ACKNOWLEDGEMENT

I gratefully acknowledge and sincerely thank **Dr.M.K.MURALITHARAN, M.S., M.Ch.,**Dean, Madras Medical College, Chennai-3 for granting me permission tocarry out this community based study.

I would like to extend my sincere and profound gratitude to **Dr. JOY PATRICIA PUSHPARANI, M.D.,** Professor, Institute of Community Medicine, Madras Medical College, Chennai-3 for having been the ever present guiding and driving force behind my study and without whom this study would not have taken its present shape.

I also thank **Dr. T.S. SELVA VINAYAGAM, M.D., D.P.H., D.N.B.,** Director, Institute of Community Medicine, Madras Medical College, for giving his valuable suggestions for the study.

I extend my sincere gratitude to **Dr. S. SUDHARSHINI, M.D.,** Assistant Professor, Institute of Community Medicine, Madras Medical College, who helped me immensely by extending her knowledge and experience during the course of this study.

I also thank **Dr. R. ARUNMOZHI, M.D**., Associate Professor, Institute of Community Medicine, Madras Medical College, for her extended support and encouragement during the course of this study.

I would like to thank **Dr. CHITRA, M.D.,** Associate Professor, Institute of Community Medicine, Madras Medical College, for her expert suggestions and encouragement during the course of this study.

I also thank **Dr. R. RAMASUBRAMANIAN, M.D**., Assistant Professor, Institute of Community Medicine, Madras Medical College, for his support rendered.

I would like to thank **The Commissioner** of Thoothukudi Corporation and **City Health Officer** of Thoothukudi Municipal Corporation for giving me permission to conduct a community-based study among the population of Thoothukudi.

I also wish to thank my colleagues and my seniors for their valuable suggestions given throughout the study. I also thank my friends who helped me in data collection.

My grateful thanks to all the participants of the study who patiently answered all my queries, and gave unhesitant consent to be part of the study, without whom this work would not have been possible.

I deeply thank my parents and family members for their moral support and love they have for me.

Above all, I thank Almighty God for his grace and blessings which helped me to complete this task successfully.

ABBREVIATIONS

BMI	-	Body Mass Index
CAD	-	Coronary Artery Disease
CHE	-	Current Health Expenditure
COPD	-	Chronic Obstructive Pulmonary Disease
CPI	-	Consumer Price Index
CVA	-	Cerebrovascular accident
CVD	-	Cardiovascular Disease
DALY	-	Disability Adjusted Life Years
FBS	-	Fasting Blood Glucose
GDP	-	Gross Domestic Product
IDDM	-	Insulin Dependent Diabetes Mellitus
IDF	-	International Diabetes Federation
NCD	-	Non-Communicable Disease
NFHS	-	National Family Health Survey
NIDDM	-	Non-Insulin Dependent Diabetes Mellitus
PPBS	-	Post prandial Blood Glucose
OHA	-	Oral Hypoglycaemic Agents
OOP	-	Out-of-pocket
OOPE	-	Out-of-pocket expenditure
RHD	-	Rheumatic Heart Disease
SES	-	Socio-economic Status
THE	-	Total Health Expenditure
USD	-	US Dollars
WHO	-	World Health Organization
WHR	-	Waist Hip Ratio

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1. INTRODUCTION

"No individual shall fail to secure adequate medical care because of the inability to pay for it"

- Bhore Committee Report, 1946

Non-communicable diseases refer to diseases that are not transmitted from person to person. They usually occur at middle age and progress over a span of decades resulting in morbidity, mortality and disability. Incidence as well as the prevalence of NCDs is on the rise. Rising prevalence may be attributed to ageing population and the chronic nature of the disease.

Four major NCDs are Cardiovascular diseases, cancers, chronic respiratory diseases and diabetes[(1)]. Out of these, Diabetes is a well-recognised cause of premature death and disability as it increases the risk of vascular, renal, retinal and neuropathic complications.

1.1. GLOBAL BURDEN OF NCDs:

In 2012, NCDs were the cause of 68% of deaths (38 million) worldwide. In most parts of the world, deaths from non-communicable diseases far exceeded those from infectious, maternal, perinatal and nutritional conditions combined.More than 40% of the total NCD deaths were premature deaths, that is, under the age of 70 years. Around 82% of these premature deaths occur in low- and middle-income countries. It has been projected that the total number of NCD deaths will increase

from 38 million in 2012 to 52 million by 2030. Around 4% of global NCD deaths were due to diabetes[2].

In 2014, the global prevalence of diabetes was 9%. Globally, there were 366 million people with diabetes in 2011. This will increase to 552 million people by 2030[3].

In 2013, 5.1 million people died due to diabetes worldwide. In 2012, around 89 million DALYs were lost due to diabetes.Diabetes is considered as the leading cause for blindness, renal failure and lower limb amputation. Among type II diabetic individuals, about 52% and 11% of deaths were due to cardiovascular and renal complications respectively[4].

1.2. BURDEN OF NCDs IN INDIA:

India is experiencing a rapid epidemiologic transition with a rising burden of non-communicable diseases. According to a WHO report, by 2020, CVDs will be the largest cause of mortality in India. In 2012, NCDs accounted for 60% of total deaths in India. Almost 2% of these deaths were directly due to diabetes[2].

In 2003, among the age group 20-79 years, India had the largest number of diabetic people (35.5 million) in the world. This number is estimated to increase to 73.5 million by 2025[5].The prevalence of diabetes in India in 2012 was 9.1%[2].The mortality due to diabetes was more among males than among females. Deaths due to diabetes had increased by 41% in the year 2010 when compared to the year 2000[6].

Besides genetic and environmental factors, increase in population ageing, urbanization, unhealthy lifestyle changes, affluence associated with dietary excess and insufficient physical activity appear to be the potential reasons for the increase in disease burden in India.

1.3. SOCIO-ECONOMIC IMPACT OF NCDs:

NCDs pose a major problem in developing countries in terms of premature mortality, morbidity and disability. NCDs already have a disproportionate mortality in low- and middle-income countries. Nearly three quarters (28 million) of deaths due to NCDs occur in these countries. Further 82% of premature deaths worldwide occur in these countries[(2)]. This reflects the inadequate or inappropriate investment in NCD prevention and control.

NCDs cause significant mortality and morbidity with considerable loss of potentially productive years (aged 35 – 64 years) of life[(7)]The cumulative lost output in low- and middle-income countries associated with NCDs was projected to be more than USD 7 trillion over the period 2011-2025. Six percent of cumulative lost output was due to diabetes[(8)].

Health-care cost for NCDs are also high pushing many families to poverty. Beyond the direct impact of high health-care cost on households, the impact of NCDs on adults of productive age indirectly affects national income through reduced productivity and a reduction in the number of hours people engage in

work.Premature death is a major consideration since most of these deaths occur among the breadwinners of families.

In India, the probability of occurrence of death between the ages 30 years and 70 years from one of the four main NCDs is 26.2%. That is, in 2012, an individual of age 30 years had 26.2% chance of death from one of the four main NCDs before his/her 70th birthday[(2)]. Most of them belonging to this age group are economically productive.

National and individual costs for addressing these diseases and loss of productivity due to the disease and premature deaths act as barriers for poverty reduction and sustainable development. NCDs were estimated to reduce the economic growth by about 5-10%. The economic losses due to NCDs in low- and middle-income countries during 2011-2025 have been estimated to be around US$ 7 trillion annually. This amount is far exceeding when compared to the amount of US$ 11.2 billion required annually for implementing high-impact cost-effective interventions for NCD prevention[(2)].

1.4. ECONOMIC BURDEN DUE TO DIABETES

Diabetes is a life-long commitment both to the patient and to the provider. Diabetics are at higher risk of developing micro vascular and macro vascular complications and other co-morbidities than non-diabetics. Hence, they require close monitoring by the health care providers to prevent dangerous complications that may further increase the healthcare cost.

The cost implications of diabetes to society are multifold:

1. Direct costs
    a. Direct medical costs - consultation costs, investigation costs, medicinal costs, hospitalization costs, costs of treating complications.
    b. Direct non-medical costs – transportation costs and time utilized for care.
2. Indirect costs – man days lost, loss of productivity, disability payment, social security, tax rebates.
3. Intangible costs – pain, anxiety, depression, stree, insecurity, inconvenience, reduced quality of life.

In 2013, the financial burden of diabetes was USD 548 billion dollars worldwide (11% of total health spending on adults). Only 20% of global health expenditure on diabetes was made in low- and middle-income countries where there are 80% of diabetic cases.This includes both government and out-of-pocket expenditure. In 2035, the worldwide financial burden of diabetes is estimated to be USD 627 billion dollars[(5)].

People from low- and middle- income spend majority of their expenses on diabetes from their own pockets[(9)]. In developing countries like India where most of the health care expenditure is out-of-pocket, diabetes pose an enormous economic burden on the patients. This burden is further aggravated by the lack of appropriate health insurance policies.

Moreover, lack of awareness among people is a leading cause of delayed diagnosis that increases the economic burden to the individual. In India, there were 31 million undiagnosed diabetes cases. Undiagnosed diabetes was responsible for an additional USD 18 billion in healthcare costs in one year in US[10].

Hence, early detection and timely treatment of diabetes through primary health-care approach seems to be a cost-effective intervention. If implemented appropriately, it can reduce the need for more expensive treatments.

2. OBJECTIVES

2.1. AIM

To assess the out-of-pocket expenditure on diabetes among the people with diabetes mellitus in urban Tamilnadu.

2.2. OBJECTIVES

A. PRIMARY

To estimate the quarterly out-of-pocket expenditure incurred by the diabetic patients among the urban population of Thoothukudi district.

B. SECONDARY

1. To determine the factors that influence the out-of-pocket expenditure on Diabetes Mellitus.
2. To study the coping mechanisms for increasing health-care expenditure on diabetes.

3. JUSTIFICATION

1. In India, both public and private sectors exist. The government-organised hospitals offer treatment at free of cost or subsidized. There seems to be great discrepancy in the cost of managing diseases even within private health sectors.

2. Many prefer private health care, although it is more costly. In India, 80% of the outpatient visits and nearly half of the hospital stays is covered by private sectors[(11)]**.**

3. In India, majority of healthcare financing (73%) is through household out-of-pocket[(12)].

4. In Tamilnadu, the public expenditure on health is very less, contributing only 6.83% of total health expenditure in the year 2012-13. People rely heavily on their out-of-pocket expenditure for their health care[(13).]

5. Health insurance coverage in India is very less. According to NFHS-3, health insurance coverage was only 4%. This further implies that majority of healthcare expenditure is out-of-pocket.

6. People spend huge amount out-of-pocket for healthcare. Nevertheless, the effectiveness of healthcare remains questionable both at private and public health sectors.

7. There is scarcity of studies on the out-of-pocket expenditure on diabetes in Tamil Nadu especially the studies that include ambulatory care cost.

8. Several studies showed that the prevalence of diabetes was more among the urban population. The healthcare cost for diabetes was also higher for the urban population. Hence, this study was done among the urban population of one of the southern districts in Tamilnadu[14–16].

9. Most of the studies on health care expenditure of diabetes included only direct cost. Since estimates of the indirect cost of diabetes, that is, the cost of lost production are as high as direct cost or even higher than those for direct cost, this study attempted to include indirect cost as well[17].

10. Various factors like age, gender, income, health care provider, presence of complications and the type of treatment influence the out-of-pocket expenditure. Therefore, this study aimed to study the factors that influence the out-of-pocket expenditure on diabetes.

11. The financial burden on diabetes among low-income households is higher. Since health-care expenditure on diabetes in low-income groups can lead to poverty and this in turn aggravates the disease and its complications, this study was designed to know the coping mechanisms for high health-care cost.

4. REVIEW OF LITERATURE

4.1. HEALTHCARE EXPENDITURE IN INDIA

Healthcare services in India are provided at three levels across the country; the Union, state and local governments (urban and rural local bodies). These services are categorized as government schemes. However, the primary responsibility of providing healthcare services is primarily of state governments. These services are financed through tax and non-tax revenues and a separate budget is determined for these services[18].

Government (Union government, state government and local government together) spent about INR 1,29,778crores, that is, 28.6% of total health expenditure (THE) in the financial year 2013-14. This share equates to 1.15% of GDP and INR 1042 per capita[12].

The share of the union government in the total government health expenditure (including health insurance schemes through union government) was INR 44,564 crores, which equates to 0.4% of GDP, 34% of total government health expenditure and INR 358 per capita[12].

The share of the states/Union Territories and local government (combined together) and health insurance schemes through state government was estimated at INR 85,215 crores, which equates to 0.75% of GDP, 66% of total government health expenditure and INR 684 per capita[12].

The current total government health expenditure is 0.9% of GDP which equates to INR 786 per capita. The union government shares about 6.6% of current health expenditure, which equates to INR 223 per capita. The state governments/union territories share about 11% of current heath expenditure that equates to INR 371 per capita. Urban local bodies share about 0.9% of current health expenditure and rural local bodies about 0.7% of current health expenditure[12].

Health insurance (both private and government) schemes share about 7.6% of current health expenditure.

Current expenditure by households (including prepayments for insurance premiums) is INR 3,06,938 crores (2.7% of GDP, 67.7% of THE and 72.9% of current health expenditure), of which **current OOP spending on health is estimated at INR 2,90,932 crores (2.6% of GDP, 64.2% of THE and 69.1% of current health expenditure) and INR 2336 per capita**[12].

In Tamilnadu, the percentage of public expenditure on health is on the decreasing trend. In the year 2009-10, the public expenditure on health was 7..77% while in the year 2012-13 it has decreased to 6.83%[13].

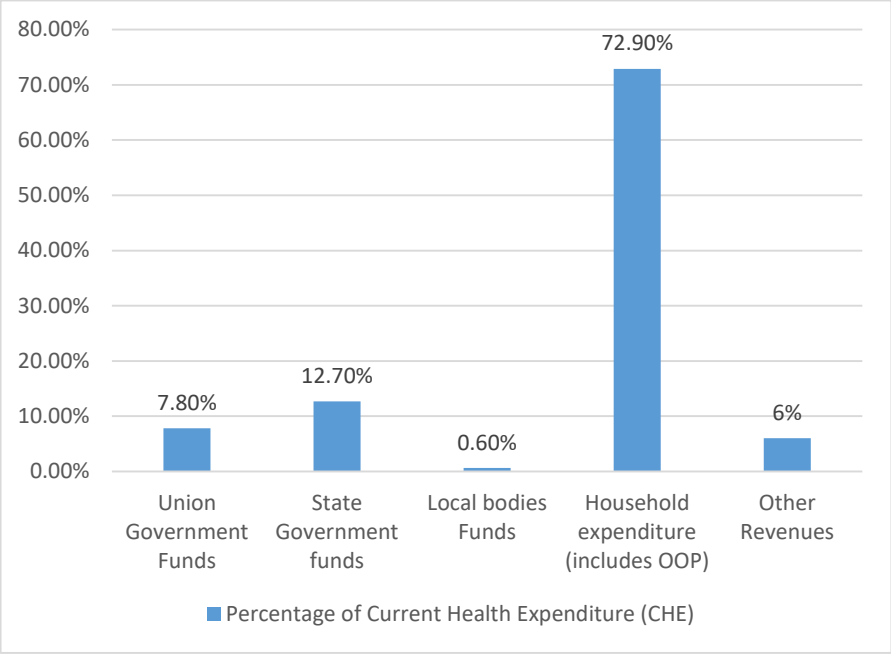


Figure 1Distribution of Current Health Expenditure (CHE) in India by source of financing [12]

4.2. OUT-OF-POCKET HEALTH EXPENDITURE

Out-of-pocket expenditure on health is defined as the percentage of private expenditure on health[9].Out-of-pocket payments are defined as the "payments made by an individual/household at the point of service directly where the cost of the health good or service is either not covered under any social protection or insurance scheme or is partially covered."[18] It is a part of private health expenditure.

Out-of-pocket payment can be of three types:

1. Payment at point of service at a private or public facility
2. Payment at point of service as part of cost sharing when enrolled in a government scheme (user fees) or compulsory contributory insurance schemes

3. Cost sharing (co-payments, deductibles etc.) when enrolled in voluntary insurance schemes[18].

This includes expenditures on inpatient care, outpatient care, family planning, immunization, drugs, diagnostics, medical non-durables, therapeutic appliances from various healthcare institutions[19].

Globally, in 2013, 20.6% of total expenditure on health (THE) was out-of-pocket. The out-of-pocket expenditure was lowest in high income group (12.6% of THE) and highest in lower income group (49.7% of THE)[19].

India has a very large proportion of household health expenditures. In 2013, the Total Health Expenditure (THE) was 3.9% of GDP, out of which 50.9% of total health expenditure was out-of-pocket. Total Health Expenditure is estimated to increase up to 4.9% of GDP in 2040[19]. The out-of-pocket expenditure in India is 89% for the year 2014[20].

The share of NCDs in the total out-of-pocket health expenses incurred by households is on the increasing trend. NCDs contributed for 31.6% of total out-of-pocket health expenses in the year 1995-96. This share increased to about 47.3% of total out-of-pocket health expenses in the year 2004. The odds of impoverishment are higher for those hospitalized for NCDs than those hospitalized for communicable diseases[21].

4.3. PREVALENCE OF DIABETES

According to IDF (2003), the current worldwide prevalence of diabetes is 5.1% among adults aged 20-79 years[5].

A study by Ramachandran et al (1997) showed the rising trend in the prevalence of NIDDM in urban Indians. It increased from 8.2% in 1989 to 11.6% in 1994[22].

A study by Ramachandran et al (2001) on the "High prevalence of diabetes and impaired glucose tolerance in India: National Urban Diabetes Survey" showed that the prevalence of diabetes and impaired glucose tolerance was 12.1% and 14% respectively[14].

A cross-sectional study by Sadikot SM et al (2004) in India using the WHO 1999 criteria showed that the prevalence of diabetes among individuals aged 25 years and above was 4.3% and impaired glucose tolerance was 5.2%. The prevalence was more among urban areas (5.9%) when compared to rural areas (2.7%)[23].

A study done by Anjana RM et al (ICMR-INDIAB) study (2011) in Tamilnadu showed that the prevalence of diabetes and prediabetes in Tamilnadu are 10.4% and 8.3% respectively[24].

Chennai Urban Rural Epidemiology Study(CURES) by Anjana RM et al (2015) showed that the incidence of diabetes, pre-diabetes and "any dysglycaemia" among individuals with normal glycaemic tolerance was 22.2, 29.5 and 51.7 per 1000 person-years respectively[25].

4.4. RISK FACTORS FOR DIABETES

A study done by Ramachandran et al (1992) showed that urban population had NIDDM prevalence of 8.2% while rural population had a prevalence of 2.4%. Age, BMI, WHR and urbanization were considered as the best predictors of NIDDM[26].

Study by Ramachandran et al (1997) among the urban Indians showed that the mean age of diabetic population was 40 ±12years. Age, WHR, BMI and female sex were significantly associated with the disease prevalence[22].

Study by Ramachandran et al (2001) showed that the prevalence of diabetes and impaired glucose tolerance was high in urban areas. There was no gender difference in the prevalence of diabetes. The prevalence of diabetes had a significant association with increasing age, BMI, WHR, family history of diabetes, monthly income and sedentary physical activity[14].

A study done on “Intra-urban differences in the prevalence of metabolic syndrome in southern India” by Mohan et al (2001) showed the following: Middle-income group had a diabetes prevalence of 12.4% while lower-income group had a prevalence of only 6.5%. The relative odds ratio for prevalence of diabetes increases significantly with increase in the monthly income[27].

A study on “Impact of poverty on the prevalence of diabetes and its complications in urban southern India” by Ramachandran et al (2002) showed that age-standardized prevalence of diabetes was lower in low-income groups.

Parameters like age, BMI, higher income, WHR and physical activity were significantly associated with the prevalence of the disease[28].

According to IDF (2003), the greatest number of diabetes is among 40-59 years age category. There is female predominance in diabetic prevalence. The number of people with diabetes is higher among urban areas when compared to rural areas[5].

A study done by Kinra et al (2010) on sociodemographic pattern in risk factors for NCDs among rural villagers of India showed that diabetes was more prevalent in people with higher socioeconomic position. Risk factors for diabetes like obesity and dyslipidaemia was more prevalent in south India than in north India[29].

ICMR-INDIAB study done in Tamilnadu in 2011 showed that factors like age, male sex, family history of diabetes, abdominal and generalised obesity, urbanization, hypertension and income status were significantly associated with the disease[24].

A study by Kumpatla et al (2013) among the inpatients admitted for complications of diabetes showed that the majority of the patients belonged to the age group 50-59 years. The mean duration of diabetes was 13.6 ± 8.6 years[30].

4.5. HEALTHCARE EXPENDITURE ON DIABETES

A study by Henriksson et al (2000) at Sweden on the direct costs of type 2 diabetes showed that the annual cost for diabetes was 25,000 Swedish Kronor[31].

A study by Brandle et al (2003) on the direct medical costs of type 2 diabetes using health insurance claims showed that the cost for individuals with diet-controlled type 2 diabetes, BMI 30 kg/m^2 and with no complications was USD 1700 for men and USD 2100 for women[32].

A prevalence-based cost of illness study (2006) done by Khowaja et al in Pakistan showed that mean direct cost for diabetes care was Pakistani rupees 11,580. Medicines and laboratory investigations accounted for 46% and 32% of the direct cost. It was also found out that the poorest segment of society was spending nearly 18% of total family income[33].

A study by American Diabetes Association on the "Economic costs of diabetes in the U.S. in 2012" showed that annual total cost of diagnosed diabetes was USD 245 billion, direct medical cost was USD 176 billion and due to reduced productivity was USD 69 billion. Hospitalization cost accounted for 43% of the total cost, medicines for treating complications accounted for 18%, ant diabetic and diabetes supplies accounted for 12%, physician office visit for 9% and nursing charges for 8% of the total cost[17].

A study on the estimation of direct cost of diabetes was conducted in Arab region by Abdesslam et al showed that annual average mean direct cost for a

diabetic individual was estimated to be USD 351, USD 529, and USD 860 in low, medium and high cost scenarios respectively[34].

Study by Rayappa et al (1999) showed that the costs of medicines accounted for one-third of the total direct medical cost[35].

A study was done by Shobhana et al (2000) on expenditure incurred by diabetes patients on health care attending secondary care facilities at Chennai. It showed that the median expenditure by patients attending private hospitals was INR 4510 per year with a range from INR 360 to INR 75200[36].

Another study done by Shobhana et al (2002) on health care cost among 209 Type I diabetic individuals from Southern India showed that the annual median cost was INR 13,980 ranging from INR 2046 to INR 87,150. The median family income percent spent on health care was 22%[37].

Study done by Grover et al (2004) on cost of ambulatory care among 50 out-patients with diabetes mellitus showed that the total annual care cost for the 50 patients was INR 14,508, the largest proportion being contributed by direct cost (68%) followed by indirect cost (28.7%) and provider's cost (2.8%). Most of the indirect cost was due to loss of income to the patients[38].

Study done by Ramachandran et al (2007) showed that the total median expenditure on health care was INR 10,000 among urban population and INR 6260 among rural population. A secular increase of 113% was observed in the total expenditure between 1998 and 2005 after accounting for inflation[39].

Study by Kumar et al (2008) showed that the annual mean expenditure on ambulatory care for diabetes was INR 6000. This comprised 1-3% of the total family income of the patients. Cost of medicines constituted about 54% of total health care expenditure[40].

Engelgau et al (2012) did a comparison of National Sample Survey Organisation 1995-96 and 2004 data on household health expenditure. It showed that the most common source for health expenditure was own savings and income (40-60%) followed by borrowing (30-35%) and reimbursement by employer and insurance (5-6%).[21]

A prospective observational study done by Akari et al (2013) among 150 diabetic patients over a period of 6 years showed that the total health-care cost of diabetes was 314.15 USD, of which direct medical cost constituted 92.4%, direct non-medical cost constituted 6.47% and indirect cost constituted 1.2%[41].

A study by Kumpatla et al (2013) on the direct costs of inpatient care for long term complications of diabetes from India showed that most common mode of payment of hospital bills was personal savings (48%), followed by borrowing loan (14%), company reimbursement (12%), selling property (11%), mortgage (8%) and medical insurance (7%)[30].

A study by Chandra et al (2014) showed that the mean direct cost for diabetes was INR 8822 per annum. Medicines contributed to 52.1% of direct costs, followed by surgical procedures (12.6%), investigations (11.6%) and consultation fees (10.4%)[42].

4.6. DEMOGRAPHIC FACTORS AND HEALTHCARE EXPENDITURE ON DIABETES

Study by Shobhana et al (2002) among type I patients showed that the proportion of income spent on health care was more among low income group than among high income group[37].

Study by Grover et al (2004) showed that the ambulatory cost of treating diabetes was significantly higher among people who were more educated[38].

Study by Ramachandran et al (2007) showed that the total median health care expenditure was more among urban population than among rural population. The proportion of income spent on health care was more among low income group than among higher income group[39].

Study by Kumar et al (2008) showed that educational status and gross family income had a significant correlation with the direct ambulatory cost of type II diabetes[40].

Study by ADA (2012) showed that the medical expenditure on diabetes increased with increase in age. Indirect cost due to reduced productivity was higher among males than among females[17].

Study by Akari et al (2013) showed that the economic burden of diabetes was more among males and in the age group 51-60 years[41].

Study by Kumpatla et al (2013) showed that the inpatient care cost had a significant association with age, education, occupation, residence (urban / rural) and family income[30].

Study by Chandra et al (2014) showed that lower middle income group people spent nearly 23.7% of their income on diabetes[42].

A review of literature on "Economic burden of diabetes in India" by Yesudian et al (2014) showed that the healthcare expenditure in absolute terms was higher for higher income groups. However, low-income group people spent a higher proportion of their income for diabetes[16].

4.7. DISEASE RELATED FACTORS AND HEALTHCARE EXPENDITURE ON DIABETES

A study done by Simpson et al (1996) at Saskatchewan on "The cost of major co-morbidity in people with diabetes" showed that 36.4% of total health care expenditure for diabetes was attributable to major comorbidities like cardiovascular, renal and ophthalmic complications[43].

Study by Henriksson et al (2000) at Sweden showed that the annual cost for diabetes increased with increase in duration of illness and with insulin requirement. Patients with complications spent three times more than those without complication[31].

Study by Brandle et al (2003) showed that individuals with kidney disease, cerebrovascular disease and peripheral vascular disease spent 10-30% more than

the baseline cost. Those who took insulin and with angina and myocardial infarction spent 60-90% more than the baseline cost. Those who were under dialysis spent 11-fold the baseline cost[32].

Study by Khowaja et al (2006) at Pakistan showed that increasing age, number of complications and duration of diabetes increases the cost burden to the society[33].

A study by Rayappa et al (1999) at Bangalore showed that the number of complications of the disease increases with increase in the duration of the disease. The economic costs of diabetes care increase with the duration of the disease and number of complications[35].

A study done by Shobhana et al (2000) on the economic burden of health care among diabetic individuals with foot complications in southern India showed that the median expenditure was INR 4373 for those without foot complications and INR 15450 for those with foot complications. Hospitalized patients required significantly higher expenses as compared to outpatients[44].

Study by Shobhana et al (2000) showed that inpatients had expenditure more than outpatients did. People with duration of diabetes more than 5 years spent more when compared to people with duration less than 5 years[36].

A study by Kapur et al on “Economic analysis of diabetes care” (2007) showed that the costs of diabetes care increased with presence of complications of the disease and its severity and with increase in co-morbid conditions. Hospitalized

individuals had average expenditure diabetes more than twice that of non-hospitalized individuals[45].

A study was done by Ramachandran et al (2007) on "Increasing expenditure on health care incurred by diabetic subjects in a developing country" among 556 patients from various urban and rural regions of seven Indian states. It showed that among the diabetic patients from urban population, 56.9% had no complications, 29.4% had one complication and 13.5% had two or more complications. The health-care expenditure on diabetes increased with duration of the disease, presence and number of complications, hospitalization, surgery and insulin therapy[39].

A study done by Kumar et al (2008) on the direct cost of ambulatory care of Type II diabetic patients at Delhi showed that the mean duration of diabetes was 8.1 years and the mean age at diagnosis was 45.5 years. Around 68% of the diabetic individuals had one or more comorbidity. Of the 819 individuals studied, 79.6% of them were taking OHAs only, 10.4% of them were taking insulin only and 6.9% of them were taking both OHAs and insulin for treatment. The time elapsed since diagnosis, presence of comorbidities and requirement of use of OHA or insulin had significant association with the direct ambulatory cost. It also concluded that annual expenditure on health-care was not a predictor for good diabetic control[40].

A study by Stolar et al (2010) on glycemic control and complications of type II diabetes showed that a good glycaemic control (HbA1C<7%) might delay microvascular complications of the disease[46].

Study by Akari et al (2013) in south India showed that the health-care was higher among diabetic people with comorbidities when compared to diabetic people without comorbidities. Diabetic people with macro vascular complications spent more than people with micro vascular complications and infections did[41].

Study by Kumpatla et al (2013) showed that the complications were more among people of older age and among people with longer duration of disease. Diabetic individuals with no complications spent INR 4493, with foot complications spent INR 19020, with renal complications spent INR 12690, with cardiovascular disease spent INR 13135, retinal complications spent INR 13922 and with 2 complications spent INR 17633. Median expenditure was higher for those with foot and cardiovascular complication and was highest for those with two complications. The median expenditure had a significant association with duration of illness, number of days stayed at hospital and the type of antidiabetic medication (OHA / Insulin / OHA and insulin)[30].

4.8. HEALTH RELATED BEHAVIOUR AND HEALTHCARE EXPENDITURE ON DIABETES

Study done by Rayappa et al (1999) showed that 28.2% of diabetic individuals visited government institutions and 71.8% of them visited private institutions for health check-up. Nearly 1% of the study population did self-monitoring of blood glucose[35].

Study by Shobhana et al (2000) showed that the direct cost incurred by diabetic patients in Southern India was higher among people seeking private hospitals[36].

Study by Brandle et al (2003) showed that the direct medical cost of type 2 diabetes increased by 10-30% over the baseline cost when BMI increased by 10 kg/m^2[32].

Study by Grover et al (2004) showed that the ambulatory cost of treating diabetes was higher among people who visited hospital often and among people who received more number of drugs[38].

Study done by Kumar et al (2008) on the direct cost of ambulatory care of Type II diabetic patients at Delhi showed that 52% of diabetic patients visited private individual practitioners, 18.7% visited private institutions and 19.7% visited government facilities for health care[40].

4.9. GLOBAL ACTION PLAN FOR PREVENTION AND CONTROL OF NCDs:

In 2011, more than 190 countries agreed to reduce the avoidable burden of NCDs through Global action plan for the prevention and control of NCDs 2013 – 2020. This includes nine voluntary global targets and a global monitoring framework. The objectives of the action plan are to raise the priority for prevention and control of NCDs among member states and to reduce the burden of modifiable risk factors for NCDs. Among the nine voluntary targets, five targets are related directly or indirectly to diabetes mellitus[47].

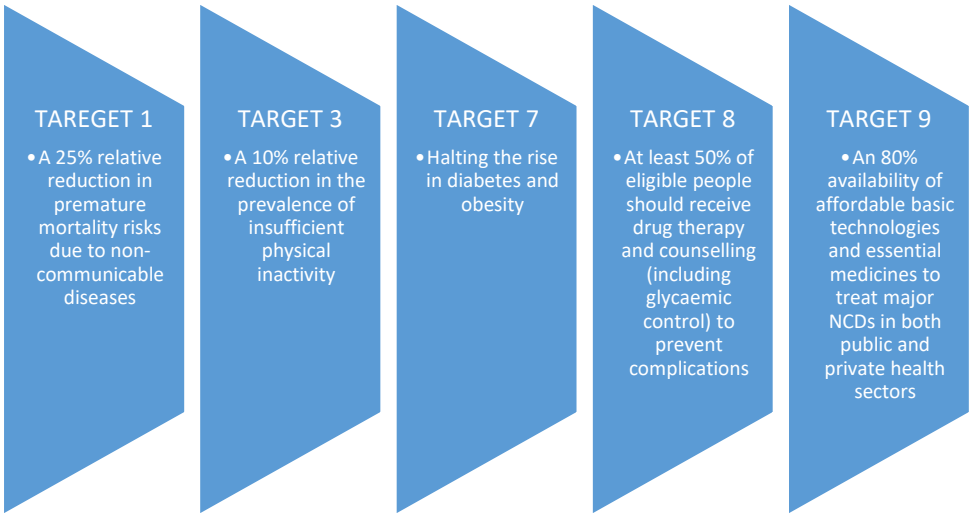


Figure 2 Voluntary targets of global NCD action plan related to diabetes [48]

The Global NCD action plan also offers a menu of "best buy" cost effective high impact interventions for NCD prevention. These include banning all forms of tobacco and alcohol advertising, replacing trans-fats with polyunsaturated fats, promoting and protecting breastfeeding, and preventing cervical cancer through screening[48].

4.10. NATIONAL RESPONSE

Non-communicable diseaseshave been identified as a major priority in India. In response to the rising burden of non-communicable diseases, Government of India has initiated an integrated National Programme on Prevention and Control of Cancers, Diabetes, Cardiovascular diseases and Stroke (NPCDCS). The strategies of the programme are

1. Health promotion and prevention
2. Health system strengthening through infrastructure development and capacity building of human resources.
3. Early diagnosis and treatment
4. Integrating with the primary health care system through NCD cells at different level.
5. Surveillance, monitoring and evaluation.

The programme attempts to bring behaviour change in the community through healthy life styles in terms of diet and physical activity. It also aims at early diagnosis and treatment of major NCDs at primary health care level resulting in an overall reduction in the risk factors and burden of NCDs. The NCD cells will ensure implementation and supervision of the programme activities at various levels. It further facilitates partnership with laboratories in the private sector for early diagnosis[7].

5.METHODOLOGY

5.1. Study Design:

The study was conducted as a community based cross sectional study among the people with diabetes mellitus in urban areas of ThoothukudiCorporation.

5.2. Study Place:

The studywas conductedin urban areas of Thoothukudi Corporation.

5.3. Study Duration:

The study was done from November 2015 to August 2016. The period of field study was from April 2016 to June 2016.

5.4. Study Population:

The study population included the diabetic patients, more than 18 years of age with at least 3 months elapsed since the diagnosis of the disease, residing in Thoothukudicorporation.

Operational definition – Diabetes patients

Diabetic patients were those who had a history/clinical record for physician diagnosis of diabetes and/or current use of medications for diabetes (insulin or oral hypoglycaemic agents).

Exclusion Criteria:

1. Guests of the visited houses not residing in Thoothukudicorporation.
2. Gestational diabetes mellitus patients.

5.5. Pilot study:

A pilot study was conducted in two wards of Thoothukudi Corporationselected randomly for sample size calculation and validation of questionnaire. A sample of 40 diabetic individuals was interviewed using a semi-structured interview based questionnaire.

The data collected was analysed for the mean quarterly out-of-pocket expenditure on diabetes and the standard deviation. The results of the pilot study are as follows:

Mean quarterly OOPE = INR 3208.99

Standard deviation = INR 2095.90

Necessary modifications were done in the questionnaire after the pilot study. Questions found to be having practical difficulty at field were removed. Some of the questions were reframed after experts' opinion.

5.6. Sample Size:

Sample size was calculated using the formula:

$$N = \frac{Z^2\sigma^2}{d^2}$$

Where, Z = Standard normal deviant at 95% confidence level i.e. 1.96

σ = Standard deviation of out-of-pocket expenditure

d = Relative precision of 10%

Mean quarterly OOPE = 3208.99 INR

Standard deviation = 2095.90 INR

Sample size, N = $\frac{(1.96*1.96*2095.9*2095.90)}{(320.89*320.89)}$

= 163.8

~ 164

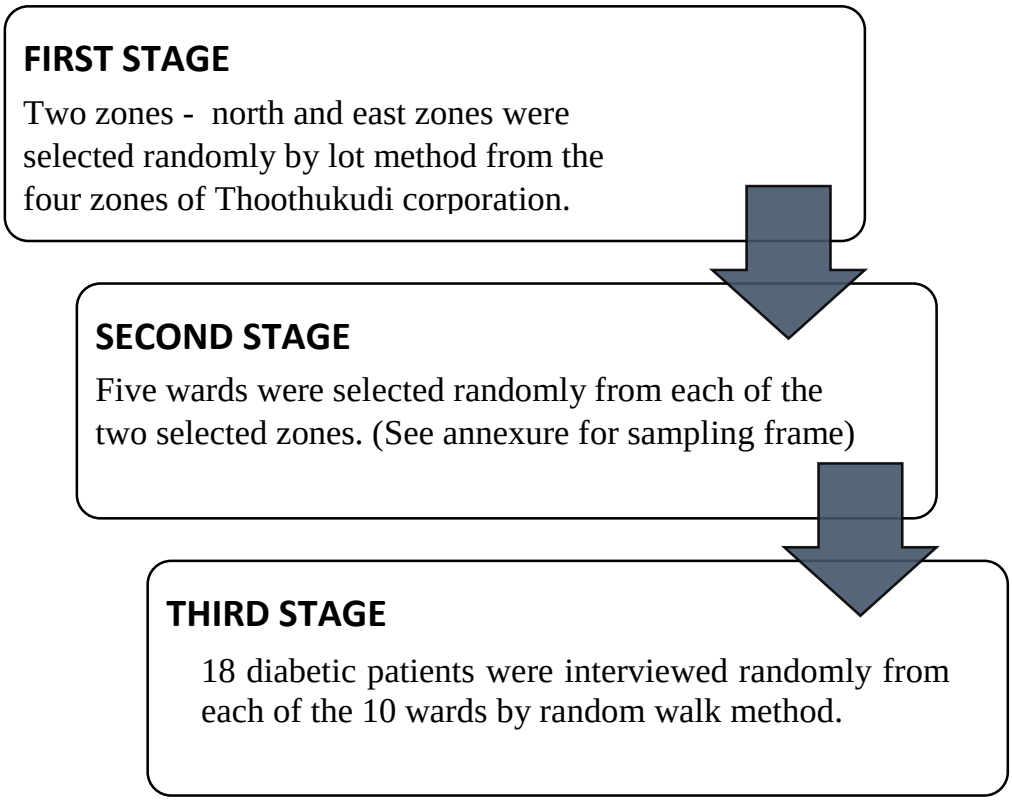
Allowing a non-response rate of 10%, N = 180.

Total sample size came around 180.

5.7. Sampling Method:

The sampling for the study population was carried out as Multi stage sampling method. The first stage involved selecting zones from Thoothukudi Corporation. Next stage involved selecting wards from the selected zones. The third stage involved selecting diabetic patients from the selected wards.

*Figure 3**Sampling steps***



A starting point was selected randomly in each ward. Then using right hand rule, door to door was done. Diabetic patients from adjacent houses were recruited for the study until 18 participants were reached in each ward. If a house was locked or if there was no diabetic patient in a house, next house was selected.

5.8. Study Tool:

The study tool was a semi-structured interview-based questionnaire administered by the investigator. It was validated with the help of experts and pilot study and necessary modification was done after the pilot study.

Questionnaire: The questionnaire consisted of sixparts, which included the following:

A. Socio-demographic details of the individuals

It included the name, age, sex, residential address, marital status, religion, education, occupation, number of family members, monthly family income, dietary habits and economic status.

B. Anthropometric and clinical parameters of the individuals

It included the individual's weight, height and the recent fasting and post-prandial blood glucose level.

C. Disease profile of the individual

It included the family history of diabetes, time elapsed since diagnosis, mode of diagnosis, presence of co-morbidities and complications of the disease and the treatment details.

D. Health-related behaviour of the individual

This part included the health seeking behaviour of the study population, health sector provider, frequency of health check-up, number of consultations done in the last three months, frequency of blood sugar testing, details about physical activity, self-testing of diabetes and diet

E. Details of expenditure on health-care

It consisted of in-depth information on expenditure which included the money spent on consultation, drugs, investigation, transportation, hospitalization and absenteeism in the form of man days lost and income lost due to the disease during the last three months.

F. Coping mechanism for increasing health-care expenditure

The last part of the study tool consisted of details regarding the coping mechanism for increasing health-care expenditure that included personal saving, borrowing loan, medical insurance, company reimbursement, selling property and mortgage.

5.9. Data Collection and Methods:

a. Ethical approval for the study was obtained from the Institutional Ethics Committee of Madras Medical College

b. Field data collection was done after obtaining official permission from the Director, Institute of Community Medicine, Dean of Madras Medical College and the Commissioner of Thoothukudi Corporation. (Annexure)

c. Data was collected from the diabetic individuals by house-to-house visit. When a house was locked during the visit, the next house was selected for the study.

d. Patient information sheet was given to the individual and the purpose of the study was elaborated to the participants. After obtaining informed

consent from the individual, a one to one interview was donebased on the semi-structured questionnaire. Patients who did not consent were not interviewed for the study.

e. Interview was conducted using the semi-structured questionnaire in Tamil. Questions were read out to the study participants and sufficient time was given for them to answer. In case the study participant have not understood a question, the questions were repeated again without probing for answer.

f. Recent fasting and post-prandial blood glucose values taken during the past three months were obtained from available clinical records.The clinical and expenditure details collected from the participants were crosschecked with records and bills available at the time of visit.

g. When there was more than one diabetic individual in a house, all the diabetic individuals in the house were interviewed. If any one of the individuals was not present during the visit, interview was done during another visit at a different time.

5.10. Services rendered:

Participants' were given health education regarding his/her medical treatment. Health education about the importance of physical activity and lifestyle modification in controlling the disease was given to the participants. Advice was also given regarding their frequency of diabetic health check-up, complications and periodical monitoring of blood glucose.

Random blood sugar was checked using a glucometer for patients who had not done any blood sugar testing during the last three months and appropriate counselling was given.

Awareness about health services available at the nearest government institutions such as availability of drugs, investigations and specialist care at medical college hospitals was given for the individuals who found difficulty in accessing and affording healthcare services for diabetes.

6. DATA ENTRY AND ANALYSIS

6.1. Data Entry

Data was collected from 180 diabetic patients. Master chart was framed in Microsoft Excel 2013 and data was entered. The data was double checkedfor any error. Three individuals'data which was found to be incomplete and erroneous were excluded from the study. Thus the total study population accounted to 177 diabetic individuals.

6.2. Data Analysis

Data was exported to Statistical Package for Software Solutions (SPSS) version 16 and was analysed. Continuous variables like quarterly out-of-pocket expenditure and categorical variables like gender and socio-economic status were presented in the form of descriptive statistics and frequency distributions respectively.

Association between categorical variables was tested using Chi square tests and Fisher exact tests.

Continuous variables like quarterly out-of-pocket expenditure was not normally distributed. Hence, association between quarterly OOPE and a grouping variable were tested using Mann-Whitney U test and Kruskal Wallis test (since the data was not normally distributed).

6.3. Variables of interest and Operational definitions

I.Occupation:

a. **Unskilled worker:** According to Minimum Wages Act, Un-skilled employee is one whose work involves simple duties that does not require learning of any special skill or experience although familiarity with work place environment is needed[49].

b. **Semi-skilled worker:** According to Minimum Wages Act, Semi-skilled worker is one whose work is limited to the performance of duties of routine nature and of limited scope. His work does not require so much of judgement and skill[49].

c. **Skilled worker:** According to Minimum Wages Act, Skilled worker is one who requires extensive knowledge of trade, craft or industry in which he is employed. His work involves independent judgement and responsibility[49].

II. Diabetic profile:

a. Control of blood glucose levels:

a. Under control: Individuals whose FBS values less than 126 g/dl and PPBS values less than 200 g/dl during the laboratory investigation in the last three months were considered to be under control

b. Poor control: Individuals whose FBS values more than or equal to 126 g/dl and PPBS values more than or equal to 200 g/dl during the laboratory investigation in the last three months were considered to be under poor control.

c. Unknown blood glucose control status: Individuals who had not done blood sugar testing during the last three months were considered to be of unknown status.

b. Voluntary diagnosis: Individuals who were diagnosed as diabetic during laboratory investigation done voluntarily to screen for the disease.

c. Complications of diabetes: Complications of diabetes included in this study are nephropathy, diabetic ulcer, neuropathy, CAD, retinopathy and CVA

d. Co-morbidities: Co-morbidities included are hypertension, hypercholesterolemia, RHD, bronchial asthma. COPD and thyroid disorders.

III. Out-of-pocket expenditure:

a. Quarterly out-of-pocket expenditure on diabetes: This is defined as any expenditure incurred by households as a payment to health practitioners and suppliers of pharmaceuticals, therapeutic appliances, and other goods and services during the last three months due to diabetes[9].

b. Direct medical cost: Direct medical costs include money spent on consultation, investigation, medication, hospitalization, management and treatment of complications.

c. Direct non-medical cost: Direct non-medical cost includes money spent on transportation to health facilities and lifestyle modification (diabetic diet and physical activity)

d. Indirect cost: Indirect cost includes absenteeism due to the disease either by the patient or by his / her caregiver in the form of man days lost and income lost to the patient / caregiver due to that absenteeism.

7. RESULTSAND ANALYSIS

7.1.SOCIO-DEMOGRAPHIC PROFILE OF THE STUDY POPULATION

The total number of study participants were 177. Out of which, 87 (49.1%) were male and 90 (50.9%) were female.

7.1.1.Age and gender distribution of the study population

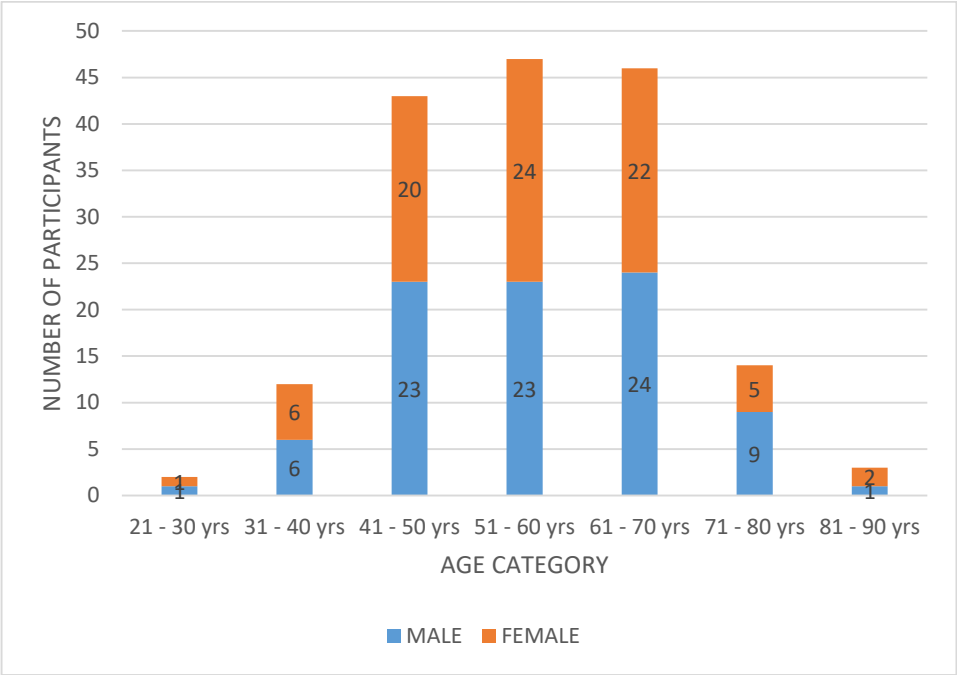


Figure 4 Age and gender distribution among study population

The above figure shows that the study group had a minimum age of 25 years and maximum age of 82 years. The mean age was 56.50 years with a standard deviation of 10.82 years.

7.1.2. Marital status of study population

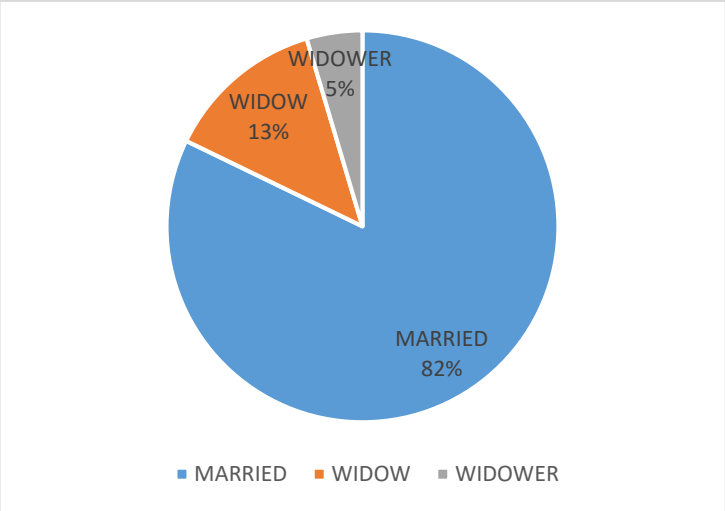


Figure 5 Pie chart showing the marital status of study population

The above figure shows that almost 82% of them were married whereas the remaining 18% were single (widow or widower).

7.1.3. Distribution of religion among study population

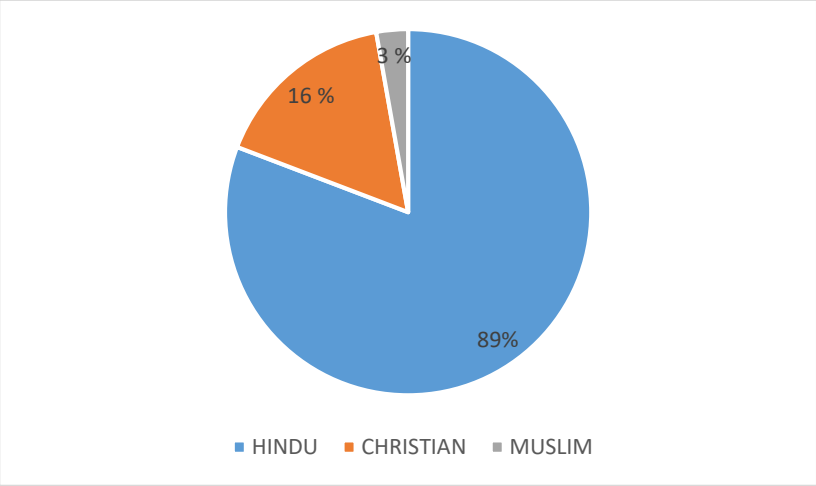


Figure 6Distribution of religion among study population

The above figure shows that among the study population, most of them (89%) belonged to Hindu religion. Out of the remaining, 16% belonged to Christianity and 3% belonged to Islamism.

7.1.4. Educational status of study population

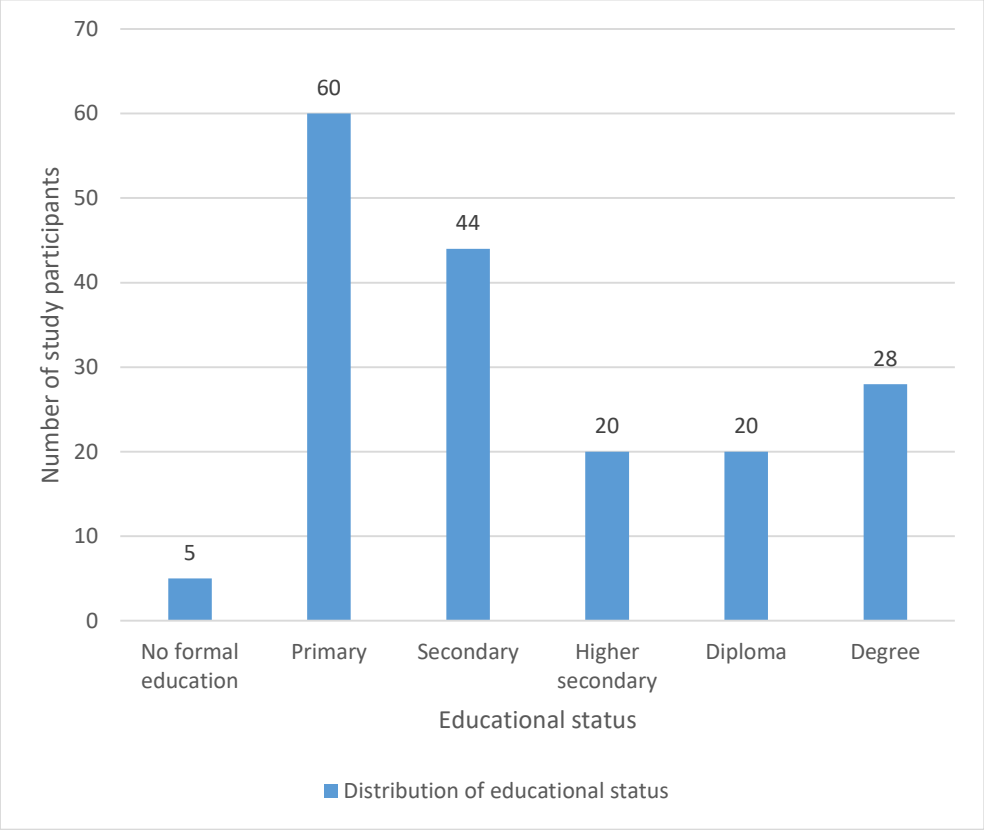


Figure 7Distribution of educational status of study population

The above figure shows that people with no formal education were 5 (2.8%), with primary level education were 60 (33.9%), with secondary level education were 44 (24.9%), with higher secondary level education were 20 (11.3%), with diploma were 20 (11.3%) and with degree were 28 (15.8%).

7.1.5. Occupational status of study population

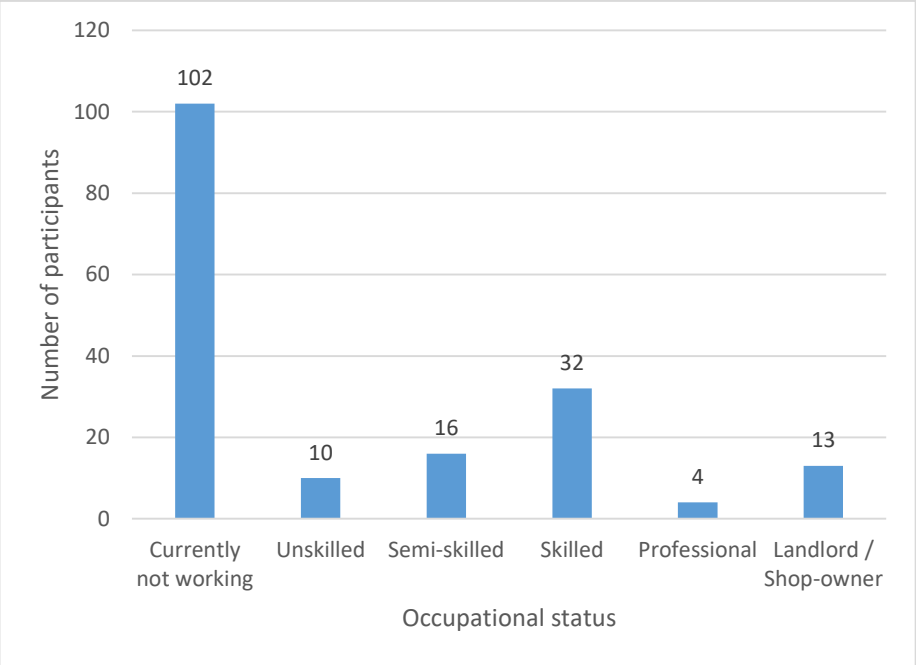


Figure 8Distribution of occupational status of study population

The above figure shows that the population had 102(57.6%) people who were not working at the time of study (which also included those who were retired), 10(5.6%) unskilled workers, 16(9.1%) semi-skilled workers, 32(18.2%) skilled workers, 4(2.2%) professionals and 13(7.3%) landlord/shop-owners.

7.1.6. Socio-economic status of the study population

Table 1 Socio-economic status of study population

Socio-economic class	Number of participants	Percentage (%)
Upper	42	23.7
Upper middle	90	50.8
Lower middle	34	19.2
Upper lower	10	5.6
Lower	1	0.6
Total	177	100

The above table shows that nearly 50% of individuals were in upper middle socio-economic class, according revised B.G. Prasad socio-economic classification, May 2016 CPI.

7.1.7. Economic status of study population

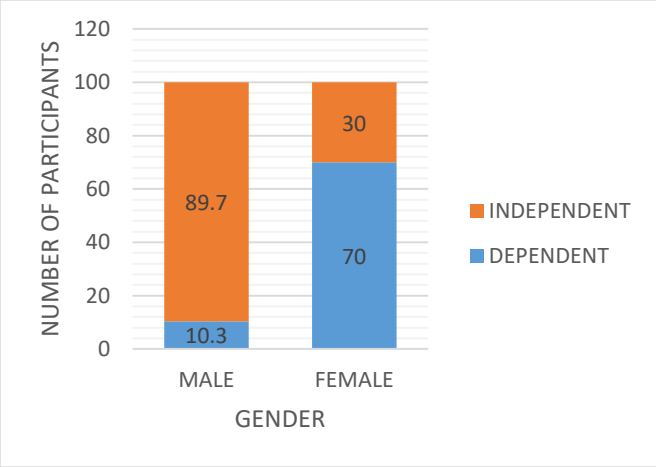


Figure 9 Difference in economic status between gender among study population

The above figure shows that nearly 90% of males were economically independent. Only 30% of females were economically independent. The difference in the economic status between genders were statistically significant ($p<0.001$). Hence, more number of males in the study population are economically independent than females.

7.2. OUT-OF-POCKET EXPENDITURE ON DIABETES

7.2.1. Estimation of quarterly out-of-pocket expenditure

Among the total study population, 10 of them were hospitalized due to the disease itself or its complications during the last three months. The median quarterly out-of-pocket expenditure on diabetes for all the diabetic individuals was **INR 1719 with an interquartile range of INR 2958**. The distribution of quarterly OOPE on diabetes is shown in the figure 10 as box plot.

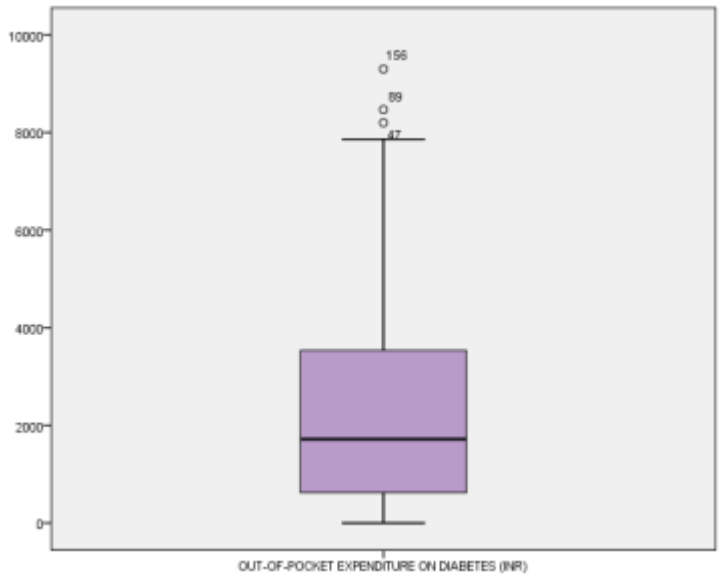


Figure 10 Boxplot showing the quarterly OOPE on diabetes of study population

The median quarterly out-of-pocket expenditure for the hospitalized patients (n=10) was INR 13,199.50 with an interquartile range of INR 29,823.70. The median quarterly out-of-pocket expenditure for the remaining individuals who were not hospitalized was INR 1593 with an interquartile range of INR 2689. Figure 11 compares the distribution of quarterly OOPE on diabetes among hospitalized and non-hospitalized individuals

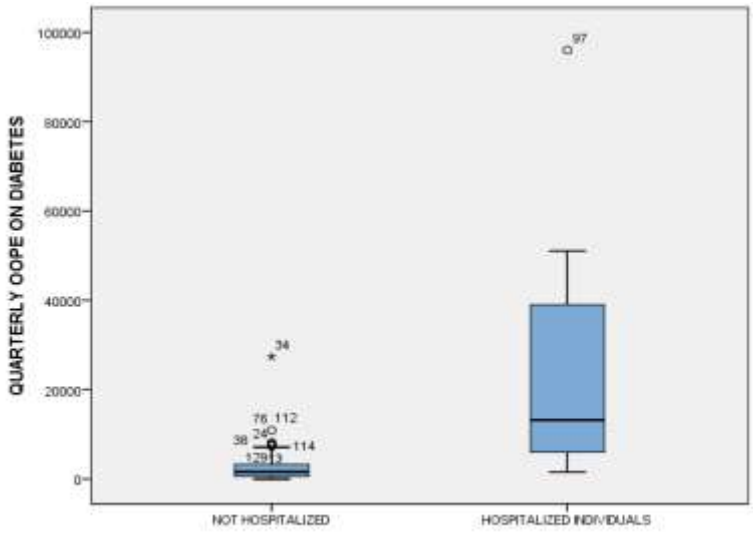


Figure 11 Boxplot showing the quarterly OOPE on diabetes among hospitalized individuals

Out of the total quarterly out-of-pocket expenditure incurred by the study population, 83% accounted for direct medical cost, 7% accounted for direct non-medical cost and 10% accounted for indirect cost. The components of out-of-pocket expenditure is depicted in the figure 12 as pie chart.

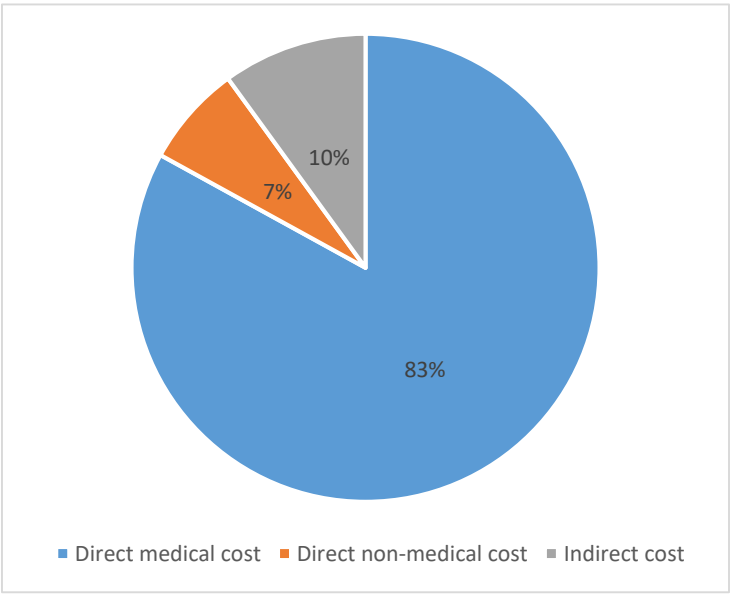


Figure 12 Pie chart showing the break-up of quarterly OOPE on diabetes

7.2.2. Direct medical cost for diabetes

The median direct medical cost for diabetes among the study population is **INR 1300 with an interquartile range of INR 2553**. The details of consultation charges, cost of drugs, investigation charges, hospitalization charges, and cost of self-testing of blood glucose have been given in the table below.

Out of the total direct medical cost spent by the diabetic individuals who were not hospitalized, more than 50% was spent for medicines, followed by 24% for investigations, 12% for self-care and 11% for consultation. This break-up of direct medical cost is depicted in the figure 13.

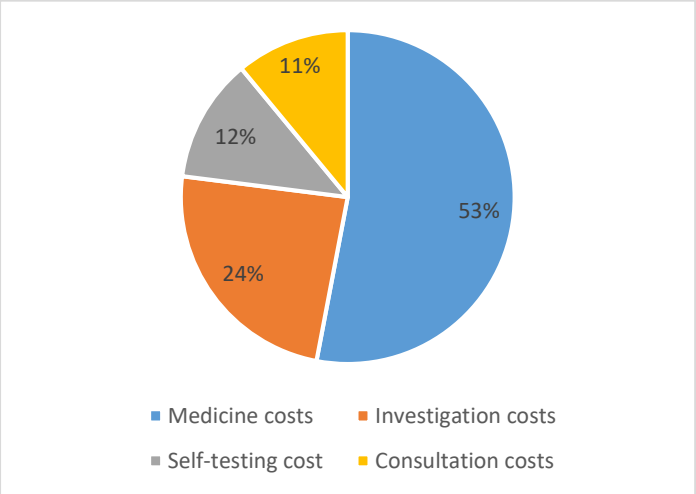


Figure 13 Pie chart showing the break-up of direct medical cost on diabetes

For the individuals who were hospitalized during the last three months (n=10), nearly 85% of the total quarterly direct medical cost was due to hospitalization.

7.2.3. Direct non-medical cost for diabetes

The quarterly median direct non-medical cost was **INR 60 with an interquartile range of INR 170.**

Among the total study population, 169 of them spent money on transportation. The median transportation cost for transportation by those 169 individuals is INR 50 with an interquartile range of INR 70.

Nearly 29 of them spent on diet modification for diabetes control. The median expenditure incurred for diet modification for 29 individuals is INR 300 with an interquartile range of INR 300.

7.2.4. Indirect cost for diabetes

Among the study population, 56 had man days lost eitherdue to the patient himself or to the caregivers during the last three months, out of which, 44 were by the patients and 12 were by the caregivers.

The median man days lost due to diabetes among the patients was 2 days with an interquartile range of 5 days while the median man days lost due to diabetes among the caregivers was 1 day with an interquartile range of 2 days.

The below figure shows the man days lost by the patients and the caregivers due to diabetes.

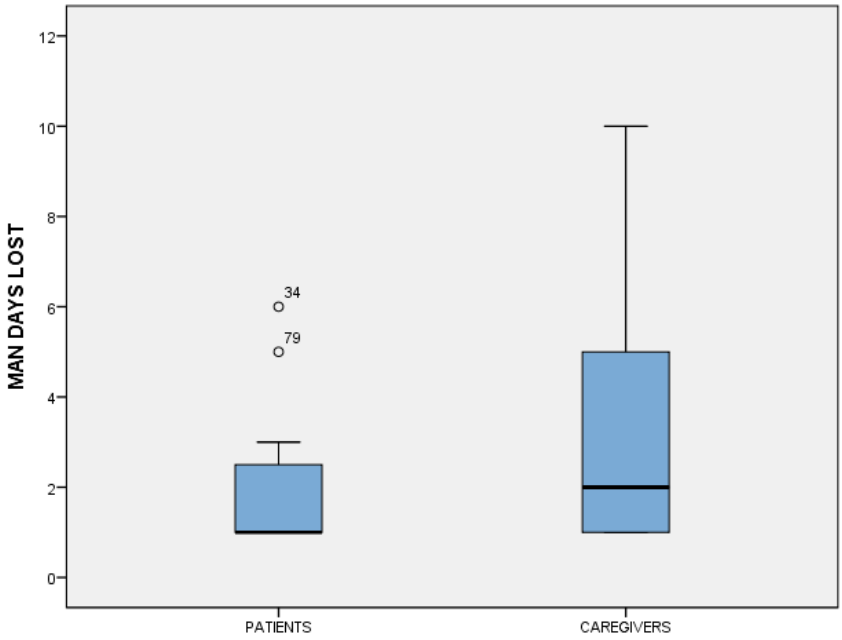


Figure 14 Boxplot showing the man days lost due to the disease

The median quarterly indirect cost for diabetes due to loss of wages was INR **450 with an interquartile range of INR 1475**.

7.2.5. Proportion of family income spent on diabetes

The total number of families studied were 151, out of which, 125 families had one diabetic patient, 22 families had two diabetic patient and 2 families had three diabetic patients. The proportion of family income spent on diabetes was analysed for 151 families.

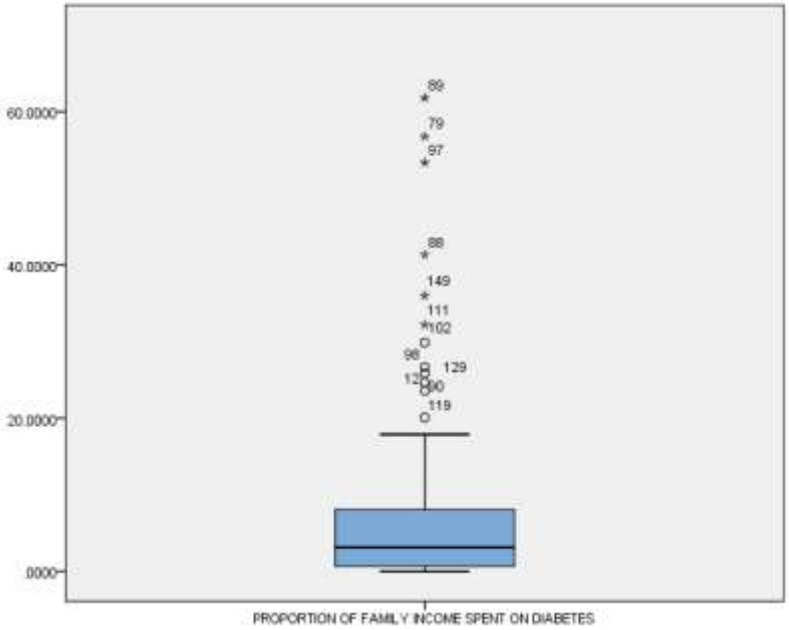


Figure 15Boxplot showing the proportion of family income spent on diabetes

The above figure shows the distribution of proportion of monthly family income spent on diabetes in a month among the study population. The average proportion of monthly family income spent on diabetes per month was **6.4%.**

7.3. RELATIONSHIP BETWEEN SOCIO-DEMOGRAPHIC FACTORS AND OOPE ON DIABETES

7.3.1. Age and quarterly OOPE on diabetes

The median quarterly OOPE on diabetes was highest among the individuals in the age group 81-90 years followed by the age group 71-80 years and the age group 61-70 years. Boxplot in figure 16 shows the distribution of quarterly OOPE on diabetes among different age groups.

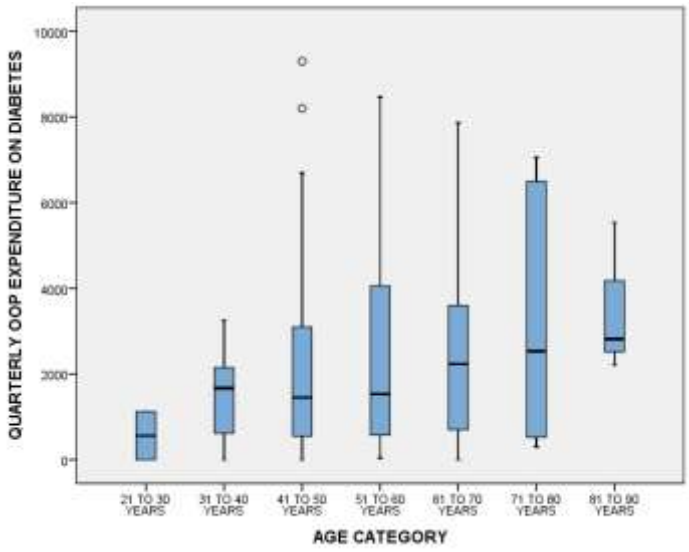


Figure 16 Box plot comparing the OOPE among various age groups

Among the various age categories, there was no statistically significant difference in the quarterly OOP expenditure spent on diabetes. (Kruskal Wallis Test, p value – 0.36). Quarterly OOPE on diabetes does not show any association with age.

7.3.2. Gender and quarterly OOPE on diabetes

Among the study population, the median OOP expenditure for 87 males was INR2387 with an interquartile range of INR 2742 and the median OOP expenditure for 90 females was INR 1249.42 with an interquartile range of INR 2836. Figure 17 shows a boxplot depicting the distribution of OOPE on diabetes among males and females

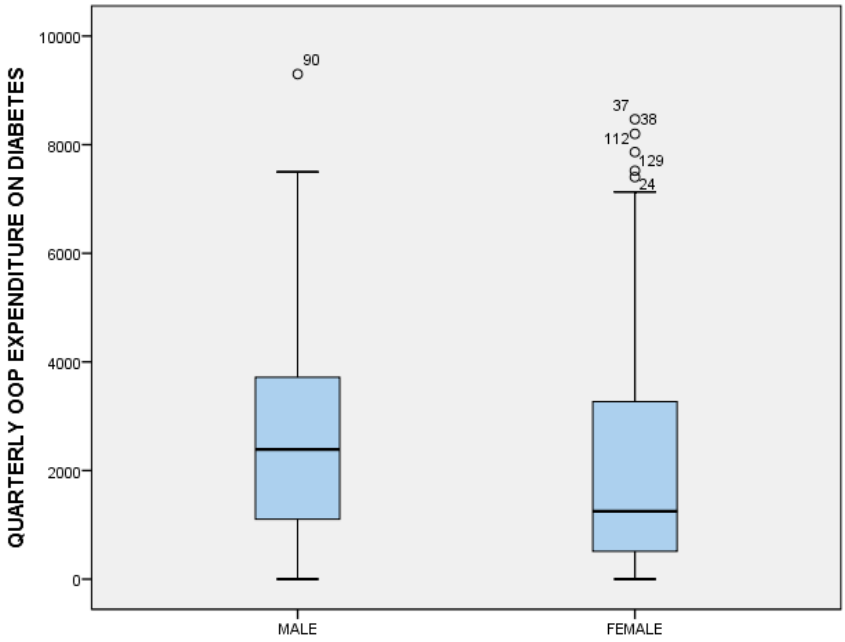


Figure 17 Boxplot showing OOPE on diabetes among male and female

There was a statistically significant difference in the quarterly OOP expenditure on diabetes between male and female (Mann-whitney U test, p value – 0.01). Males were spending more on diabetes when compared to females.

7.3.3. Socio-demographic details and quarterly OOPE on diabetes

Table 2Relationship between socio-demographic characteristics and quarterly OOPE on diabetes

CHARACTERISTICS	NUMBER OF PARTICIPANTS (N = 177)	MEDIAN QUARTERLY OOPE ON DIABETES (INR)	IQR (INR)
MARITAL STATUS			
Married male	79 (44.5%)	2570	2894
Married female	67 (38%)	1248.83	2762
Widow	23 (13%)	1436	3177
Widower	8 (4.5%)	1885.45	1874
p value – 0.7, Kruskal Wallis test			
RELIGION			
Hindu	143 (80.8%)	1719	3193
Christian	29 (16.4%)	2160	2467
Muslim	5 (2.8%)	1253.85	3727
p value – 0.85, Kruskal Wallis test			
EDUCATIONAL STATUS			
No formal education	5 (2.8%)	400	734
Primary	60 (33.9%)	1309.42	2497
Secondary	44 (24.9%)	1621	2593
Higher secondary	20 (11.3%)	2522.68	5586
Diploma	20 (11.3%)	2709.96	4163
Degree	28 (15.8%)	2825.39	3698
p value – 0.005, Kruskal Wallis test			
OCCUPATIONAL STATUS			
Not working	102 (57.6%)	1551.60	2841
Unskilled	10 (5.6%)	1122.75	1830
Semiskilled	16 (9%)	1945	3977
Skilled	32 (18.1%)	2494.33	4202
Professional	4 (2.3%)	2312.08	29558
Landlord / Shop-owner	13 (7.3%)	2190	2335
p value – 0.49, Kruskal Wallis test			

The median quarterly OOPE on diabetes was highest among married males, followed by widower and widows. It was least among married females. There was no statistically significant difference in the quarterly out-of-pocket expenditure on diabetes between married, widow and widower patients (p value – 0.7, Kruskal Wallis test).

However, there was a statistically significant difference in the quarterly OOPE expenditure between married males and married females (p value – 0.01, Mann-Whitney U test). Married males are spending more on diabetes than married females.

Regarding the religion, there was no statistically association between religion and out-of-pocket expenditure on diabetes (p value – 0.85, Kruskal Wallis test). Quarterly OOPE on diabetes does not have any association with religion of the individuals.

There was a statistically significant association between the quarterly OOP expenditure on diabetes and educational status (p value – 0.005, Kruskal Wallis test). As the level of education increases, OOPE on diabetes increases. It can be seen from the figure 18 that the quarterly OOPE was lowest for individual with no formal education and highest for individuals who had a degree.

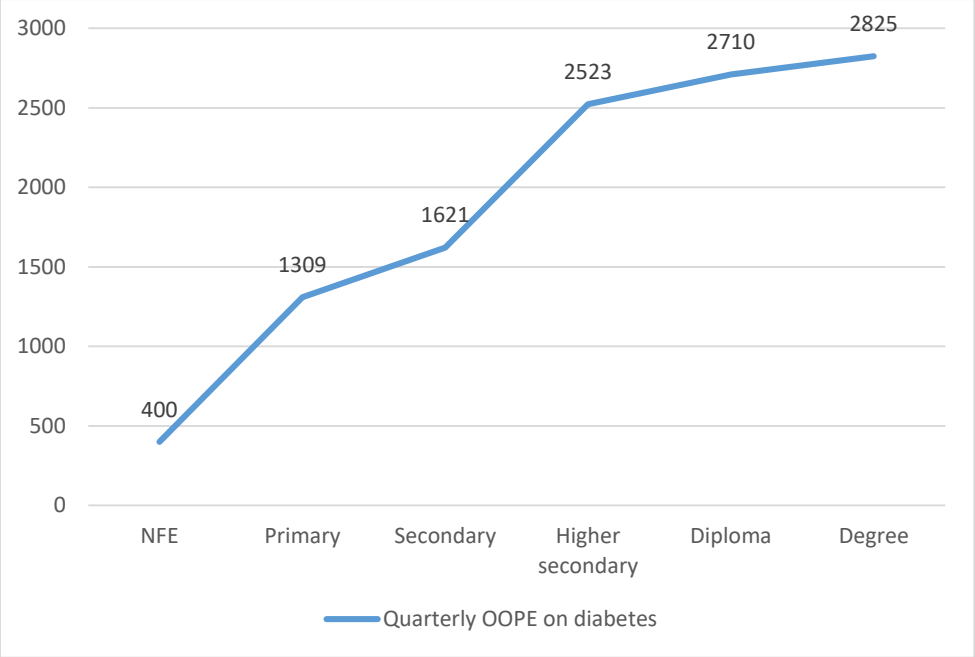


Figure 18 Line diagram showing the quarterly OOPE on diabetes and educational status

There was no statistically significant difference in the quarterly OOPE on diabetes and occupational status (p value – 0.49, Kruskal Wallis test). Occupational status does not have any association with OOPE on diabetes.

7.3.4. Economic status and quarterly OOPE on diabetes

The median quarterly OOPE on diabetes for economically dependent individuals was INR 1097.50 with an interquartile range of INR 2776 whereas for economically independent individuals was INR 2270.20 with an interquartile range of INR 2721. Figure 19 compares the distribution of quarterly OOPE on diabetes among economically dependent and economically independent individuals.

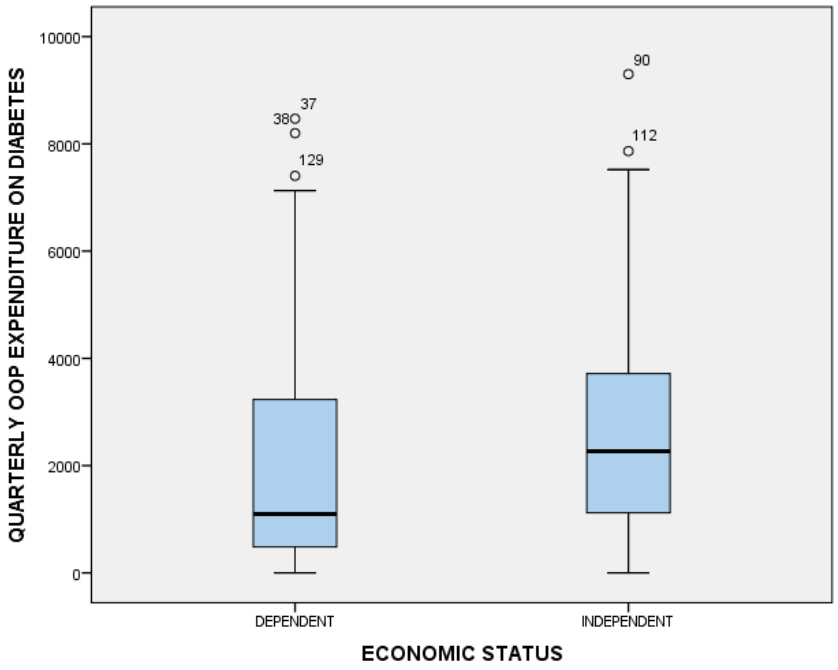


Figure 19 Boxplot comparing OOPE between economically dependent and independent patients

There was a statistically significant association between the quarterly OOP expenditure on diabetes and economic status of the study population (p value – 0.003, Mann-Whitney U test) Economically independent spent more on diabetes than economically dependent individuals.

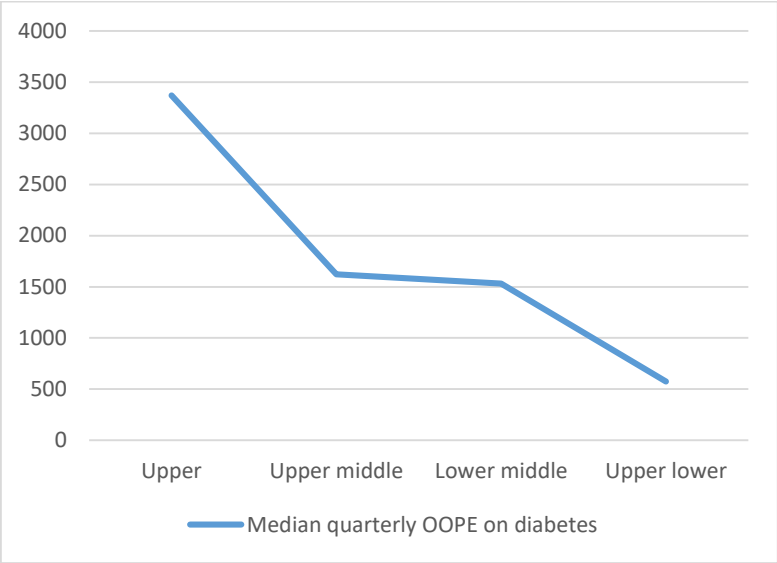


Figure 20 Line diagram showing quarterly OOPE on diabetes among various socio-economic status

Figure 20 shows that the median quarterly OOPE on diabetes is highest among upper class people and lowest among upper lower class people. Since there was only one individual in lower class, lower class was excluded for analysis.

There was a statistically significant difference in the out-of-pocket expenditure on diabetes between various socio-economic classes (p value < 0.001, Kruskal Wallis test). As the socio-economic status increases, OOPE on diabetes increases

Proportion of family income spent on diabetes had a significant association with the socio-economic status. (p value – 0.04, Kruskal Wallis test). Individuals belonging to upper class (2.3%) spent a lesser proportion of their income than individuals belonging to upper lower class (7%).

7.4. RELATIONSHIP BETWEEN DISEASE RELATED FACTORS AND OOPE ON DIABETES

7.4.1. Time elapsed since diagnosis and quarterly OOPE on diabetes

Among the study population, 10.7% of study participants had diabetes for less than 1 year, 33.9% had diabetes for 1 to 5 years, 26% had diabetes for 5 to 10 years, 20.3% had diabetes for 10 to 20 years and 9% had diabetes for more than 20 years. The mean duration of diabetes for the study population was 8.76 years with a standard deviation of 7.43 years.

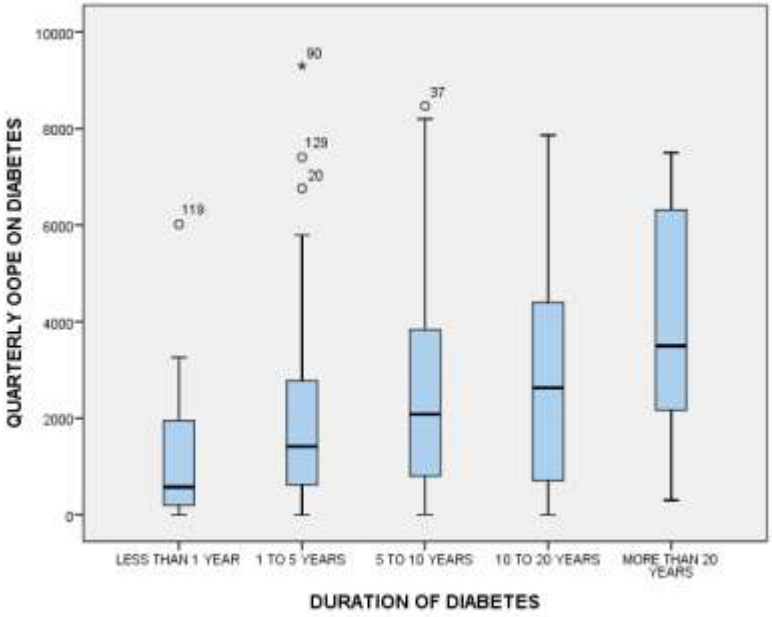


Figure 21 Boxplot comparing OOPE on diabetes with duration of the disease

Figure 21 shows the distribution of quarterly OOPE on diabetes among various age categories. There was a statistically significant association of quarterly out-of-pocket expenditure on diabetes with the duration of the disease. (p value – 0.004, Kruskal Wallis test). OOPE on diabetes increases with increase in duration of the disease.

7.4.2. Voluntary diagnosis and quarterly OOPE on diabetes

Among the diabetic individuals studied, 41 (23.2%) were diagnosed during voluntary testing for diabetes whereas 136 (76.8%) were diagnosed incidentally, that is, during any other illness or any complication due to diabetes.

Table 3 OOPE on diabetes among the patients diagnosed incidentally and voluntarily

Mode of diagnosis	Number of participants (N = 177)	Median quarterly OOPE (INR)	IQR (INR)
Incidental	136 (76.8%)	1710.08	2965
Voluntary	41 (23.2%)	1999	3064
p value – 0.83, Mann Whitney U test			

Table 3 shows that the diabetic individuals who diagnosed their disease voluntarily spent more than other individuals did during the last three months. However, there was no statistically significant association between OOP expenditure on diabetes and mode of diagnosis of the disease.OOPE on diabetes does not have any association with voluntary diagnosis of the disease.

Among those who had diagnosed their disease voluntarily, 66.7% had blood glucose level under control. Among the remaining, only 46% had blood glucose under control. There was a significant difference in blood glucose control between those who had diagnosed their disease voluntarily and others. (p value – 0.03, χ^2 test) Individuals who diagnosed their disease voluntarily had better blood glucose control.

7.4.3. Co-morbidities and quarterly OOPE on diabetes

Among the study population, 92 of them (52%) had one or more co-morbidities. The most common co-morbidity was hypertension (40.7%), followed by hypercholesterolemia (18.1%), thyroid disorders(6.2%) and asthma/COPD (2.3%).

Table 4 Quarterly OOPE on diabetes among individuals having various number of co-morbidities

Number of co-morbidities	Number of participants	Median quarterly OOPE on diabetes (INR)	IQR (INR)
None	85	1253.85	1791
One	60	2537.90	4924
Two	29	2819.50	3946
More than two	3	7403.10	-
p value <0.001, Kruskal Wallis test			

Table 4 shows the quarterly OOPE on diabetes among individuals with various number of co-morbidities. There was a statistically significant difference in the quarterly out-of-pocket expenditure on diabetes among participants having various number of co-morbidities. Quarterly OOPE on the disease increased when the number of co-morbidities increased.

7.4.4. Complications of the disease and quarterly OOPE on diabetes

Almost 66% of study population were free from any of the complications due to diabetes whereas 34% had one or more complications due to the disease. The most common complication was Coronary Artery Disease.

Table 5Quarterly OOPE on diabetes among individuals with various number of complications

Number of complications	Number of participants	Median quarterly OOPE on diabetes (INR)	IQR (INR)
None	117	1235	2112
One	56	3290.50	4305
Two	4	7015.02	25867
p value < 0.001, Kruskal Wallis test			

The median quarterly OOPE on diabetes was highest among individuals having two complications. There was a significant association between the OOPE on diabetes and the number of complications. Individuals having one or more complications spent more on diabetes than individuals having uncomplicated disease.

7.4.5. Type of treatment and quarterly OOPE on diabetes

Among the study population, most of them (85%) were taking Oral Hypoglycaemic Agents (OHAs). Around 4.5% and 7.3% of them were taking insulin alone and OHA and insulin respectively. One percent was taking alternative medicine. Around 2% of them were not taking any treatment

Table 6 Quarterly OOPE on diabetes and type of antidiabetic treatment

Type of treatment	Number of participants	Median quarterly OOPE on diabetes (INR)	IQR (INR)
OHA and insulin	13	4900.36	4079
Insulin alone	8	4397.63	3625
OHA alone	150	1551.60	2591
p value < 0.001, Kruskal Wallis test			

The median quarterly OOPE on diabetes was highest among the patients who took both OHA and insulin and was lowest among those who took OHA alone. This difference was found to be statistically significant. (p value < 0.001, Kruskal-Wallis test). Individuals taking OHA and insulin spend more on diabetes than others who take insulin alone or OHAs alone.

7.4.6. Blood glucose control and quarterly OOPE on diabetes

Among the study population, 46.3% had their blood glucose under control, 44.6% had poor blood glucose control and remaining 9% had unknown status of blood glucose control.

The quarterly out-of-pocket for the population whose blood glucose control status was known (161 patients) was analysed.

Table 7 Blood glucose control and quarterly OOPE on diabetes

BLOOD GLUCOSE CONTROL	NUMBER OF INDIVIDUALS	MEDIAN QUARTERLY OOPE ON DIABETES (INR)	IQR (INR)
Under control	82	2426.35	3537
Poor control	79	1950	2932
p value – 0.30, Mann Whitney U test			

The above table shows the quarterly OOPE on diabetes among individuals having good and poor control of blood glucose.There was statistically insignificantdifference in quarterly OOPE between the two groups.Quarterly OOPE on diabetes does not have any association with blood glucose control.

7.5. RELATIONSHIP BETWEEN HEALTH RELATED BEHAVIOUR AND OOPE ON DIABETES

7.5.1. Health service provider and quarterly OOPE on diabetes

Among 177 study population, 34 of them were using government health sector service, 138 were using private health sector and 5 were using both private and government health sector services.

Table 8 Quarterly OOPE on different health sector provider

Health sector provider	Number of individuals	Median quarterly OOPE on diabetes (INR)	IQR (INR)
Government	34	300	1444
Private	138	2260	2844
Both	5	2825.75	5572
p value < 0.001, Kruskal Wallis test			

The median out-of-pocket expenditure on diabetes for those seeking private health sectors was INR 2260 with an interquartile range of INR 2844, for those seeking government health sector was INR 300 with an interquartile range of INR 1444 and for those seeking both health sectors was INR 2825.75 with an interquartile range of INR 5572.

There was a significant difference in the OOPE on diabetes between those seeking private and government health sectors. (p value < 0.001, Kruskal Wallis test) Diabetic individuals seeking private health sector were spending more on healthcare.

7.5.2. Frequency of health check-up and quarterly OOPE on diabetes

Around 41% of study population did their diabetic check-up once in a month, 15.3% did their diabetic check-up once in two months, 20.4% did their diabetic check-up once in 3 months and 23.2% did their diabetic check-up as and when needed. The median number of consultations done during the last three months among the study population was 1 with an interquartile range of 1. Table 9 shows the quarterly OOPE on diabetes and frequency of diabetic health check-up

Table 9Frequency of health check-up and median quarterly OOPE on diabetes

Frequency of diabetic check-up	Number of participants (N = 177)	Median (INR)	IQR (INR)
Once in a month	73 (41.3%)	1900	2751
Once in 2 months	27 (15.3%)	2688.80	3084
Once in 3 months	36 (20.4%)	2420.10	3945
As and when needed	41 (23.2%)	760.15	2284
p value – 0.2, Kruskal Wallis test			

There was no statistically significant relationship between OOPE on diabetes and the frequency of diabetic health check-up. Individuals going for diabetic health check-up once in 2 or 3 months pent more than those going for health check-up once in a month or as and when needed.

7.5.3. Frequency of blood glucose testing and quarterly OOPE

Almost 61% had done FBS and PPBS testing once during the last three months whereas 9.6% had done it thrice. 9% had not done any blood glucose testing. The median number of blood glucose testing done during the last three months was1 with an IQR of 1. Figure 22 compares the quarterly OOPE on diabetes with the frequency of blood glucose testing.

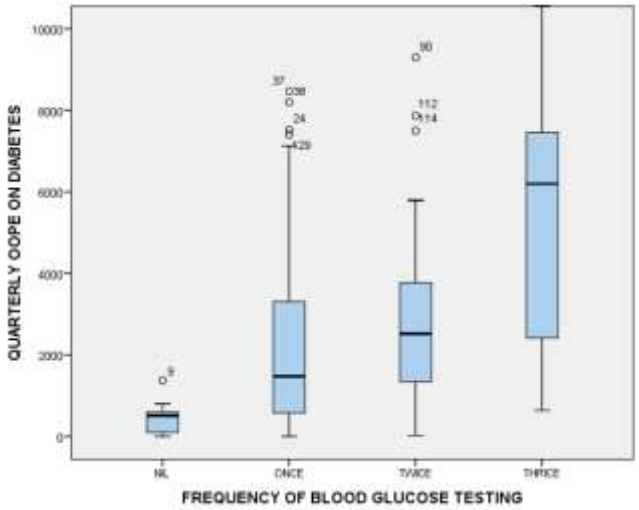


Figure 22 Boxplot comparing the OOPE with frequency of blood glucose testing

There was a statistically significant association between quarterly OOPE on diabetes and the frequency of blood glucose testing done during the last three months.(p value < 0.001, Kruskal Wallis Test). Individuals who did blood glucose testing thrice during the last three months had higher OOPE on diabetes than others. However, there was no statistically significant difference between blood glucose control and number of blood glucose testing (p value – 0.2, χ^2test)

Number of blood glucose testing during the last three months had no association with blood glucose control.

7.5.4. Physical activity and quarterly OOPE on diabetes

Among the study population, 74 (58%)of them were involved in some form of physical activities like brisk walking, cycling, fitness exercise, yoga, etc.

Table 10 Quarterly OOPE based on physical activity

Physical activity	Number of participants (N = 177)	Median OOPE on diabetes (INR)	IQR (INR)
Present	74 (41.8%)	2572.50	3709
Absent	103 (58.2%)	1368.83	2627
p value–0.003, Mann-Whitney U Test			

The above table shows that the median quarterly OOPE on diabetes was higher among the individuals involved in physical activity. There was a statistically significant difference in the quarterly OOPE on diabetes between physically active and physically inactive patients.Individuals engaging in some forms of physical activity spent more on diabetes than other.

Nearly 80% of individuals engaged in physical activity had blood glucose under control whereas only 28% of others had blood glucose under control. There was a statistically significant difference in the blood glucose control and physical activity(p value < 0.001, χ^2 test). Individuals engaging in physical activity have blood glucose level under control than others.

7.5.5. Self-monitoring of blood glucose and quarterly OOPE on diabetes

Among the study population, 32 (18%) did self-monitoring of blood glucose at home during the last three months while the remaining 82% were not doing self-monitoring of blood glucose.

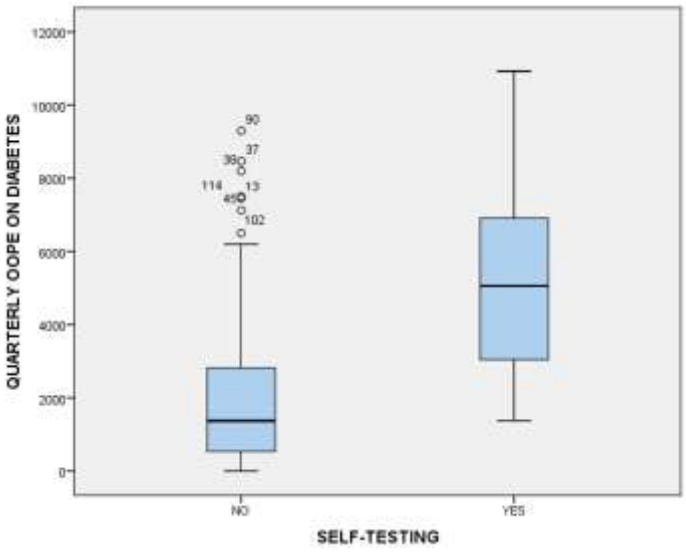


Figure 23 Boxplot comparing the OOPE with self-testing of blood glucose

The median OOPE for patients doing self-testing of blood glucose was INR 5060.29 whereas it was INR1368.83 for the remaining. This difference was statistically significant. (p value < 0.001, Mann-Whitney U test). Individuals who did self-testing of blood glucose spent more on diabetes than others. Almost 64.5% of patients doing self-testing of blood glucose had blood glucose level under control while only 47.7% of patients who did not do self-testing of blood glucose had blood glucose level under control. However, this difference was not statistically significant(p value – 0.9, χ^2 test) Self-testing of blood glucose had no association with blood glucose control.

7.6. INCREASE IN HEALTHCARE EXPENDITURE – COPING MECHANISM

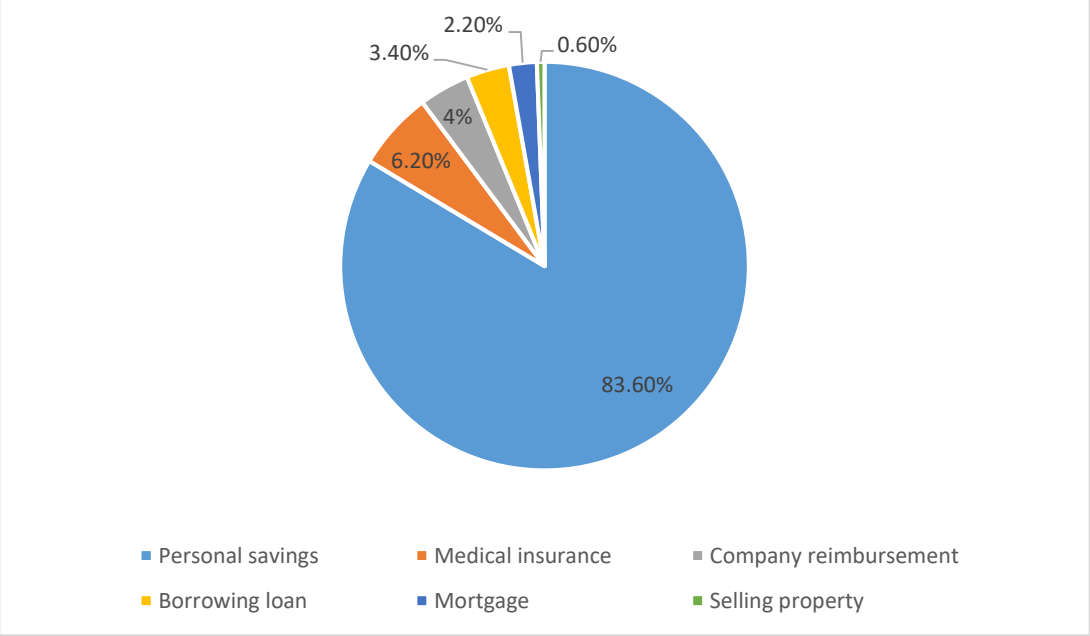


Figure 24 Pie chart showing coping mechanisms when healthcare expenditure increase

The above figure shows that the coping mechanism for increasing health-care expenditure was personal savings for majority of the study population (84%). Only 6% and 4% of the study population had medical insurance and company reimbursement respectively as coping mechanism. The remaining 6% had borrowing loan, mortgage and selling property as coping mechanisms.

8. DISCUSSION

The current study was a community-based cross-sectional study conducted at Thoothukudi district to estimate the quarterly out-of-pocket expenditure on diabetes mellitus by the urban population and to determine the factors that are associated with the OOPE. This study also aimed at studying the coping mechanism adapted by the households when the healthcare expenditure increases.

The study population included 177 diabetic individuals, with a mean age of 56.5±10.82 years. Majority of them belonged to the age group 41-60 years because most of the participants were type 2 diabetic individuals[22]. This type is diagnosed commonly after the age of 40 years.

There was almost equal distribution of males and females in the study population[14]. Nearly 80% of them belonged to the religion Hindu. Majority of them (82%) were married as majority of the study participants was between 40-59 years.

Since this study was done among urban population, only five of them had no formal education. Most of them had primary or secondary level education.

Nearly 50% of the population were above the age of 50 years and nearly 50% were females. So, the proportion of people who were unemployed or retired (currently not working) was nearly 60%.

Since the study was done among urban population, most of them belonged to upper middle and lower middle socioeconomic status. Only one individual was in the lower socioeconomic status. This was consistent with the previous study

results that the prevalence of diabetes had a significant association with monthly income and socio-economic status[14,24,27,28].More proportion of males were economically independent than females.

8.1. OUT-OF-POCKET EXPENDITURE ON DIABETES

In the current study, the median quarterly OOPE on diabetes among the urban population was found to be INR 1719 with an interquartile range of INR 2958.

From this finding, the median annual OOPE on diabetes can be roughly calculated to be around INR 6,876. This estimate is close to the estimate given by a previous study done in 2008 at Delhi which showed the annual mean expenditure to be INR 6000. The minor difference in the estimate may be due to inflation[40].

This estimate is low when compared with the study done by Ramachandran et al which estimated total median expenditure estimate as INR 10,000 among urban population. This is because the latter study was a hospital-based study done in private health sector while the current study was a community-based study. Hence, only those who seek healthcare would have been included in the latter study[39].

Chandra et al estimated a mean direct cost of INR 8822 per annum on diabetes in the city of Pune. This estimate is higher than the estimate of current study due to geographical difference in the study area. Also, the study was done

among out-patients at ophthalmology department where most of the time diabetics with complications seek for healthcare[42].

The out-of-pocket expenditure on diabetes may even be higher if more number of type I diabetic individuals were included in this study as they are dependent on insulin which increases the direct cost[37].

In the current study, majority of OOPE was due to direct medical cost, which constituted to about 83%. Out of the direct medical cost for diabetes, medicine cost constituted for about 53%. Direct non-medical cost contributed to about 7%

Several studies also showed that the greatest proportion of healthcare cost was contributed by direct cost.(38,41)As seen in the current study, studies by Kumar et al and Chandra et al also showed that medicine costs constituted nearly 50% of total healthcare expenditure.(40,42)Direct non-medical cost estimate in the current study was comparable to the estimate given by a prospective study done in south India over a period of 6 years[41].

In this current study, it was found out that the mean proportion of family income spent on diabetes was 6.4%. This proportion increases even more if the family has a type I diabetic individual[37].

This proportion is much lesser when compared to the proportion given in a study done at Delhi (1-3%) because the latter study was done only among high and middle income group population at Delhi, a cosmopolitan city[40].

8.2. SOCIO-DEMOGRAPHIC FACTORS AND OOPE ON DIABETES

In the current study, the median quarterly OOPE on diabetes was more among the individuals aged 61 to 80 years. However, the results were not statistically significant.

Similar studies had also reported that the healthcare expenditure on diabetes increases with increase in age[17,30].The increase in OOPE on diabetes with age can be due to micro vascular and macro vascular complications of the disease and other co-morbidities that occur as the disease advances.

In this study, it was found that diabetic males were spending more than diabetic females.It was also found that economically independent individuals spent more on diabetes than economically dependent individuals.

This finding was found to be consistent with previous studies which also showed that males were spending more than females for diabetes care[17,41].

This gender difference in OOPE on diabetes can be related to the economic dependency status of women. In the current study, more females were economically dependent than males. More females were found to be unemployed in the study population with lower level of education than males. They were dependent on others for financial support and decision-making.

This can be a reason for inadequate awareness about the importance of regular monitoring of disease.

In the current study, since most of the males were working, the increase in expenditure among males might be contributed mainly by indirect cost (income lost due to absenteeism).

In the current study, it was found that married females spent the least on diabetes care. Widow and widower also spent less than married males.

Married females spent less because of lack of awareness about the disease. Most of them were economically dependent and found difficulty in accessing health care in terms of time and distance.

In the present study, it was found out that the OOPE on diabetes increased as the level of education increased. Several studies also showed similar results that the cost of treating diabetes was higher among individuals who were educated more[30,37,38,40].

Individuals with higher educational levels have more awareness about the disease and they tend to spend more on diabetes care than others. Individuals with higher education also have higher income when compared to others. Higher income group people tend to spend more on diabetes than lower income group people.

Current study showed that OOPE on diabetes was more for upper SES individuals than for lower SES individuals. The proportion of family income spent on diabetes increased as the SES decreases.

This result was consistent with previous study results that showed the medical expenditure on diabetes was higher for high-income groups and low-income groups spent a larger proportion of income on diabetes care[16,30,39,40,42].

When considering in absolute terms, the expenditure was higher for higher high-income group. When considering in proportion of income spent, the proportion seemed to higher for low-income group. In the current study, the proportion of family income spent as much as 60% of monthly family income for diabetes. This extreme proportion can be due to hospitalization during the study period. However, it is evident from the finding that diabetes can lead to catastrophic health expenditure due to complications pushing many low-income families to poverty and debt.

8.3. DISEASE RELATED FACTORS AND OOPE ON DIABETES

Current study showed that the OOPE on diabetes increased with increase in time elapsed since diagnosis of the disease.

Several studies had also reported the same results showing that the duration of disease had a significant association with the medical expenditure on diabetes[30,31,33,35,39,40,44].

As the duration of diabetes increases, age of the individual increases and the disease advances. This leads to occurrence of micro- and macro-vascular complications of the disease[35]. The healthcare cost for managing complicated diabetes are higher than for uncomplicated disease. Hence, the OOPE on diabetes increases with increase in duration of disease.

In the current study, it was found out that OOPE on diabetes was higher for individuals who had diagnosed their disease during voluntary testing of blood sugar.

The higher OOPE on diabetes among these individuals can be due to good health seeking behaviour of them in keeping their disease progress under check.

Present study showed that nearly half of the study population had at least one co-morbidity, the most common co-morbidity being hypertension.

The most common comorbidity among the diabetic individuals studied was hypertension (41%). Previous study had also showed similar result[24]. This can be attributed to the common risk behaviour among the urban population like unhealthy diet and sedentary lifestyle resulting in both diseases.Several studies had also supported similar finding that costs of diabetic care increased with increase in co-morbid conditions[40,41,45].

Present study showed that nearly 34% of study population had at least one complication, the most common being cardiovascular disease. Individuals with complicated diabetes spent significantly more than others.

Several studies had shown similar results that medical expenditure on diabetes increased with presence and severity of disease complications. Complications of diabetes lead to hospitalization which further increases the cost[30–33,35,39,43–45].

The increased healthcare cost due to complication can be reduced if the occurrence of complication is delayed. A good glycemic control can delay the occurrence of complication of diabetes[46].

In the current study, it was showed that OOPE for individuals who were taking insulin alone for treatment was four times the OOPE for individuals who were taking OHAs alone.

Previous studies had also reported similar results that healthcare expenditure on diabetes had significant association with the type of antidiabetic treatment[30–32,39,40].

The healthcare expenditure can even be higher among individuals with type II diabetes. Most of the patients taking insulin as antidiabetictreatment rely heavily on private health sector since insulin is available only in government tertiary care centres at affordable cost.This consumes a huge amount from their pockets. Present study implicates the need for supply of insulin and syringes in primary care level.

Current study showed that only 46% of study population had blood glucose level under control. This study did not reveal any association of OOPE on diabetes with blood glucose control.

46% is a huge proportion which may reflect the inadequate and inappropriate preventive measures against the disease. As said earlier, a good glycemic control is needed to delay complication thereby to reduce the healthcare cost of diabetes[46]. Present study has shown that achieving good control does not necessarily require higher healthcare expenditure. Physical activity has shown to be a cost-effective way in keeping blood glucose level under control.

8.4. HEALTH RELATED BEHAVIOUR AND OOPE ON DIABETES

Present study showed that nearly 80% of study population seek private health sector for healthcare. Obviously,OOPE on diabetes was significantly higher for individuals who seek private health sector than individuals who seek government health sector.

Previous study done in the year 1999 at Bangalore showed that the diabetic individuals seeking government health institution was nearly 28%[35].But in our study, there is a slight decrease (20%). Increase in accessibility and affordability to private health sector among urban population in the recent years may be a reason for the increase in this proportion.

Several studies have also shown that the healthcare expenditure for individuals seeking private health sector is high[35,40,44]. This finding is because government health sector provides treatment for diabetes at free of cost or subsidized cost. In spite of the huge sum of money spent on health check-up in private healthcare provider, only 52% of the individuals had their blood glucose under control.

Current study showed that only 40% of study population did their diabetic health check-up once in a month.

Previous study has shown that individuals having more number of diabetic health check-up spent more[38]. In the present study individual who had done their health check-up once in a month spent lesser than others. This is because most of the people who had done their health check-up once in a month seek government

health sectors where treatment is given at free of cost. However, individuals seek government health sector monthly only to collect drugs. That may be the reason why only 41% of those who attend government health sector have blood glucose level under control.

Current study showed that 10% of study population was doing blood glucose testing monthly. Individuals who did blood glucose **testing thrice during the last three months spent significantly more than the rest of the individuals.**

This finding is very obvious that individuals doing blood glucose testing often are spending more. This seems to be contrary to the previous result that individuals seeking health check-up often are spending less. Thus, we can conclude that individuals seeking government health sector are not undergoing regular monitoring of blood glucose. However, present study also showed that frequency of blood glucose testing had no association with glycaemic control.

Current study showed that nearly 58% of study population involved in some form of physical activity. OOPE on diabetes was significantly higher among those involved in physical activity.

More number of diabetic individuals involving in physical activity shows that the health seeking behaviour and awareness about its importance is reasonably good among the urban population.Since the health seeking behaviour is good, individuals involved in physical activity tend to spend more on their healthcare.

Current study showed that nearly 18% of individuals were doing self-testing of blood glucose. OOPE on diabetes was higher among the individuals who did self-testing of blood glucose.

Previous study done in the year 1999 has shown that only 1% of diabetic individuals did self-testing of blood glucose. This proportion has shown an increase in current study. It shows the increasing awareness and health seeking behaviour about diabetes among the urban population over a period of 15 years. People who did blood glucose self-monitoring had complications or were using insulin for treatment. This may be the reason why Individuals doing self-testing of blood glucose had more OOPE on diabetes. However, it did not have any association with blood glucose control in present study.

8.5. INCREASE IN HEALTHCARE EXPENDITURE – COPING MECHANISM

Current study showed that the most common coping mechanism when the healthcare expenditure increases was personal savings (84%).

This finding was consistent with previous study findings that the most common source for health expenditure was personal savings and income. Medical insurance coverage among diabetic individuals has also shown to be consistent with previous studies[21,30].

The study population had also mentioned borrowing loan, selling property and mortgage as coping mechanism. This can be very well reduced by increasing awareness about available health insurance schemes and about the facilities available at government health facilities.

9. SUMMARY AND CONCLUSION

A community-based cross-sectional study was done to estimate the quarterly out-of-pocket expenditure incurred by the diabetic patients among the urban population of Thoothukudi district, to determine the factors that influence the out-of-pocket expenditure on diabetes mellitus and to study the coping mechanisms adapted by the study population when healthcare expenditure increases.

An interview-based semi-structured questionnaire was used to collect data regarding socio-demographic details, disease details and expenditure detains from the study population.

The study revealed the following results:

1. The median quarterly out-of-pocket expenditure on diabetes incurred by the study population was INR 1710 with an interquartile range of INR 2958.
2. The average proportion of monthly family income spent on diabetes was 6.4%.The proportion of monthly family spent on diabetes was more for lower socio-economic class people.
3. Age did not have any association with OOPE on diabetes
4. Diabetic males spent more on diabetes than diabetic females did.
5. Marital status did not have any association with OOPE on diabetes. However, married males spent significantly more than married females.
6. As the educational level increased, OOPE on diabetes increased.
7. Occupational status did not have any association with OOPE on diabetes

8. Economically independent individuals spent more on diabetes than economically dependent did. Females were found to be economically dependent.
9. As the time elapsed since diagnosis of diabetes increased, OOPE spent on diabetes increased.
10. Individuals who had diagnosed their disease during voluntary testing of blood glucose spent more from out-of-pocket. But it was not statistically significant.
11. OOPE on diabetes significantly increased as the number of co-morbidities increased.
12. OOPE on diabetes significantly increased with number of complications.
13. Individuals taking insulin for antidiabetic treatment spent significantly more than those taking OHAs alone.
14. There was no association of blood glucose control with OOPE on diabetes.
15. Private health sector seekers spent more from out-of-pocket than government health sector seekers.
16. Frequency of diabetic health check-up had no association with OOPE on diabetes.
17. As the frequency of blood glucose testing increased, OOPE on diabetes increased.
18. Individuals involved in some form of physical activity spent significantly more than those who did not involve in physical activity.

19. Individuals who self-monitored blood glucose had significantly more OOPE than rest of the individuals.
20. The most common coping mechanism adapted when the healthcare expenditure increased was personal savings (84%), followed by medical insurance (6.2%), company reimbursement (4%), borrowing loan (3.4%), mortgage (2.2%) and selling property (0.6%)

The study highlights high out-of-pocket expenditure incurred by diabetic patients and the factors associated with OOPE in an urban area of Tamilnadu. Healthcare professionals and the community should be aware of high financial burden due to the disease. They should be aware of the factors that drives the cost. Effective intervention should be done at all levels to diagnose the disease early so that occurrence of complications is delayed, thus reducing the household financial burden.

10. LIMITATIONS OF THE STUDY

1. The study was done only among urban population in one of the southern districts of Tamilnadu. Hence, the results cannot be generalized to diabetic individuals present in rural areas.
2. The study tool used was a semi-structured interview based questionnaire. Most of the details collected during the interview was self-reported by the individuals.
3. Indirect cost due to reduced productivity (income lost to the government or employer) isnot estimated in this study since it is difficult to quantify.
4. Details were collected regarding the healthcare expenditure for the last three months. There is a possibility of recall bias in this study
5. Information bias of the expenditure and medical details could have occurred in this study leading to underestimation or overestimation of out-of-pocket expenditure.

11. RECOMMENDATIONS

1. Lower socioeconomic status households spent a larger proportion of their income on diabetes. Accessibility and affordability of quality health services should definitely be improved to benefit low-income groups.
2. Diabetic individuals taking insulin as antidiabetic treatment spent more out-of-pocket. Hence, insulin and syringes need tobe made available at affordable prices at primary health care levels in the future.
3. Out-of-pocket expenditure increases with increase in number of complications. The occurrence of complications can be postponed with proper glycemic control. Secondary prevention, that is, early diagnosis and treatment to be effectively done through screening programmes.
4. Health insurance schemes can try to cover the ambulatory healthcare cost for lower socio-economic status people and economically dependent individuals.
5. Future studies can be done in detail to estimate the indirect cost and intangible cost as well and to analyse the cost-effectiveness of various primary interventions.

REFERENCES

1. WHO | Noncommunicable diseases [Internet]. [cited 2016 Sep 11]. Available from: http://www.who.int/mediacentre/factsheets/fs355/en/#

2. WHO | Global status report on noncommunicable diseases 2014 [Internet]. WHO. [cited 2016 Aug 25]. Available from: http://www.who.int/nmh/publications/ncd-status-report-2014/en/

3. Zhang P, Zhang X, Brown J, Vistisen D, Sicree R, Shaw J, et al. Global healthcare expenditure on diabetes for 2010 and 2030. Diabetes Res Clin Pract. 2010 Mar;87(3):293–301 [Internet]. [cited 2016 Sep 14] Available from: http://www.ncbi.nlm.nih.gov/pubmed/20171754.

4. Morrish NJ, Wang SL, Stevens LK, Fuller JH, Keen H. Mortality and causes of death in the WHO Multinational Study of Vascular Disease in Diabetes. Diabetologia. 2001 Sep;44 Suppl 2:S14-21 [Internet] [cited 2016 Sep 21]. Available from: http://www.ncbi.nlm.nih.gov/pubmed/11587045.

5. International Diabetes Federation. IDF diabetes atlas, 7th edition [Internet]. [cited 2016 Sep 12]. Available from: http://www.diabetesatlas.org/

6. WHO | Global Health Estimates [Internet]. WHO. [cited 2016 Sep 6]. Available from: http://www.who.int/healthinfo/global_burden_disease/en/

7. Operational Guideline_NPCDCS :: Ministry of Health and Family Welfare [Internet]. [cited 2016 Sep 12]. Available from: http://www.mohfw.nic.in/showfile.php?lid=653

8. WEF_Harvard_HE_GlobalEconomicBurdenNonCommunicableDiseases_2011.pdf [Internet]. [cited 2016 Sep 15]. Available from: http://www3.weforum.org/docs/WEF_Harvard_HE_GlobalEconomicBurdenNonCommunicableDiseases_2011.pdf

9. Out-of-pocket health expenditure (% of private expenditure on health) | Data [Internet]. [cited 2016 Sep 14]. Available from: http://data.worldbank.org/indicator/SH.XPD.OOPC.ZS

10. Zhang Y, Dall TM, Mann SE, Chen Y, Martin J, Moore V, et al. The economic costs of undiagnosed diabetes. Popul Health Manag. 2009 Apr;12(2):95–101. [Internet] [cited 2016 Sep 20] Available from: http://www.ncbi.nlm.nih.gov/pubmed/19361252

11. WHO | National Macroeconomics and Health Reports [Internet]. WHO. [cited 2016 Sep 14]. Available from: http://www.who.int/macrohealth/action/national_reports/en/

12. National Health Accounts Estimates for India 2013-14 [Internet]. National Health Accounts Technical Secretariat, Ministry of Health and Family Welfare, Government of India; 2016 [cited 2016 Sep 20]. Available from: http://www.mohfw.nic.in/showfile.php?lid=4016

13. Health sector financing by centre and states/UTs in India [2009-10 to 2012-13] [Internet]. National Health Accounts Cell, Ministry of Health and Family Welfare, New Delhi; [cited 2016 Sep 20]. Available from: http://www.mohfw.nic.in/showfile.php?lid=2275

14. Ramachandran A, Snehalatha C, Kapur A, Vijay V, Mohan V, Das AK, et al. High prevalence of diabetes and impaired glucose tolerance in India: National Urban Diabetes Survey. Diabetologia. 2001 Sep;44(9):1094–101. [Internet] [cited 2016 Sep 17] Available from: http://www.ncbi.nlm.nih.gov/pubmed/11596662

15. Anjana RM, Pradeepa R, Deepa M, Datta M, Sudha V, Unnikrishnan R, et al. The Indian Council of Medical Research-India Diabetes (ICMR-INDIAB) study: methodological details. J Diabetes Sci Technol. 2011 Jul;5(4):906–14. [Internet] [cited 2016 Sep 19] Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3192597/

16. Yesudian CA, Grepstad M, Visintin E, Ferrario A. The economic burden of diabetes in India: a review of the literature. Glob Health. 2014;10(1):1–18. [Internet] [cited 2016 Sep 23] Available from: https://globalizationandhealth.biomedcentral.com/articles/10.1186/s12992-014-0080-x

17. American Diabetes Association. Economic costs of diabetes in the U.S. in 2012. Diabetes Care. 2013 Apr;36(4):1033–46. [Internet] [cited 2016 Sep 20] Available from: http://www.ncbi.nlm.nih.gov/pubmed/23468086

18. National Health Accounts Guidelines for India [Internet]. National Health Accounts Technical Secretariat, Ministry of Health and Family Welfare, Government of India; 2016 [cited 2016 Sep 20]. Available from: http://www.mohfw.nic.in/showfile.php?lid=4017

19. Dieleman JL, Templin T, Sadat N, Reidy P, Chapin A, Foreman K, et al. National spending on health by source for 184 countries between 2013 and 2040. The Lancet. 387(10037):2521–35.

20. WHO | Out-of-pocket expenditure on health as a percentage of private expenditure on health (US$) [Internet]. WHO. [cited 2016 Sep 14]. Available from: http://www.who.int/gho/health_financing/out_pocket_expenditure/en/

21. Engelgau MM, Karan A, Mahal A. The Economic impact of Non-communicable Diseases on households in India. Glob Health. 2012;8(1):1–10. [Internet] [cited 2016 Sep 18] Availbale from: http://www.ncbi.nlm.nih.gov/pubmed/22533895

22. Ramachandran A, Snehalatha C, Latha E, Vijay V, Viswanathan M. Rising prevalence of NIDDM in an urban population in India. Diabetologia. 1997;40(2):232–7. [Internet] [cited 2016 Aug 30] Available from: http://www.ncbi.nlm.nih.gov/pubmed/9049486

23. Sadikot SM, Nigam A, Das S, Bajaj S, Zargar AH, Prasannakumar KM, et al. The burden of diabetes and impaired glucose tolerance in India using the WHO 1999 criteria: prevalence of diabetes in India study (PODIS). Diabetes Res Clin Pract. 66(3):301–7. [Internet] [cited 2016 Seo 20] Available from: http://www.ncbi.nlm.nih.gov/pubmed/15609460

24. Anjana RM, Pradeepa R, Deepa M, Datta M, Sudha V, Unnikrishnan R, et al. Prevalence of diabetes and prediabetes (impaired fasting glucose and/or impaired glucose tolerance) in urban and rural India: phase I results of the Indian Council of Medical Research-INdia DIABetes (ICMR-INDIAB) study. Diabetologia. 2011 Dec;54(12):3022–7. [Internet] [cited 2016 Sep 21] Available from: http://www.ncbi.nlm.nih.gov/pubmed/21959957

25. Anjana RM, Shanthi Rani CS, Deepa M, Pradeepa R, Sudha V, Divya Nair H, et al. Incidence of Diabetes and Prediabetes and Predictors of Progression Among Asian Indians: 10-Year Follow-up of the Chennai Urban Rural Epidemiology Study (CURES). Diabetes Care. 2015 Aug;38(8):1441–8. [Internet] [cited 2016 Sep 20] Available from: http://www.ncbi.nlm.nih.gov/pubmed/25906786

26. Ramachandran A, Snehalatha C, Dharmaraj D, Viswanathan M. Prevalence of glucose intolerance in Asian Indians. Urban-rural difference and significance of upper body adiposity. Diabetes Care. 1992 Oct;15(10):1348–55. [Internet] [cited 2016 Sep 20] Available from: http://www.ncbi.nlm.nih.gov/pubmed/1425100

27. Mohan V, Shanthirani S, Deepa R, Premalatha G, Sastry NG, Saroja R, et al. Intra-urban differences in the prevalence of the metabolic syndrome in southern India -- the Chennai Urban Population Study (CUPS No. 4). Diabet Med J Br Diabet Assoc. 2001 Apr;18(4):280–7. [Internet] [cited 2016 Sep 19] Available from: http://www.ncbi.nlm.nih.gov/pubmed/11437858

28. Ramachandran A, Snehalatha C, Vijay V, King H. Impact of poverty on the prevalence of diabetes and its complications in urban southern India. Diabet Med J Br Diabet Assoc. 2002 Feb;19(2):130–5. [Internet] [cited 2016 Sep 20] Available from: http://www.ncbi.nlm.nih.gov/pubmed/11437858

29. Kinra S, Bowen LJ, Lyngdoh T, Prabhakaran D, Reddy KS, Ramakrishnan L, et al. Sociodemographic patterning of non-communicable disease risk factors in rural India: a cross sectional study. BMJ [Internet]. 2010 Sep 27;341. Available from: http://www.bmj.com/content/341/bmj.c4974.abstract

30. Kumpatla S, Kothandan H, Tharkar S, Viswanathan V. The costs of treating long-term diabetic complications in a developing country: a study from India. J Assoc Physicians India. 2013 Feb;61(2):102–9. [Internet] [cited 2016 Sep 20] Available from: http://www.ncbi.nlm.nih.gov/pubmed/24471248

31. Henriksson F, Agardh CD, Berne C, Bolinder J, Lönnqvist F, Stenström P, et al. Direct medical costs for patients with type 2 diabetes in Sweden. J Intern Med. 2000 Nov;248(5):387–96. [Internet] [cited 2016 Sep 20] Available from: http://www.ncbi.nlm.nih.gov/pubmed/11123503

32. Brandle M, Zhou H, Smith BRK, Marriott D, Burke R, Tabaei BP, et al. The Direct Medical Cost of Type 2 Diabetes. Diabetes Care. 2003 Jul 25;26(8):2300. [Internet] [cited 2016 Sep 20] Available from: http://www.ncbi.nlm.nih.gov/pubmed/12882852

33. Khowaja LA, Khuwaja AK, Cosgrove P. Cost of diabetes care in out-patient clinics of Karachi, Pakistan. BMC Health Serv Res. 2007;7(1):1–8. [Internet] [cited 2016 Sep 21] Available from: http://bmchealthservres.biomedcentral.com/articles/10.1186/1472-6963-7-189

34. Aldesslam B, Boutayeb W, Mohammed E, Lamili B, Saber B. Estimation of the direct cost of diabetes in the Arab region. Mediterranean Journal of nutrition and metabolism. 2014;7:21–32.

35. Rayappa P, Raju K, Kapur A. Economic costs of diabetes care. The Bangalore Urban district diabetes study. Int J Diab Dev Countries. 1999;(19):87–96. [Internet] [cited 2016 Sep 22] Available from: http://diabetes.org.in/journal/1999_july-sept/article1.pdf

36. Shobhana R, Rama Rao P, Lavanya A, Williams R, Vijay V, Ramachandran A. Expenditure on health care incurred by diabetic subjects in a developing country — a study from southern India. Diabetes Res Clin Pract. 48(1):37–42. [Internet] [cited 2016 Sep 23] Available from: http://www.ncbi.nlm.nih.gov/pubmed/10704698

37. Shobhana R, Rama Rao P, Lavanya A, Williams R, Padma C, Vijay V, et al. Costs incurred by families having Type 1 diabetes in a developing country--a study from southern India. Diabetes Res Clin Pr [Internet]. 2002;55. Available from: http://dx.doi.org/10.1016/S0168-8227(01)00276-5

38. Grover S, Avasthi A, Bhansali A, Chakrabarti S, Kulhara P. Cost of ambulatory care of diabetes mellitus: a study from north India. Postgrad Med J [Internet]. 2005;81. Available from: http://dx.doi.org/10.1136/pgmj.2004.024299

39. Ramachandran A, Ramachandran S, Snehalatha C, Augustine C, Murugesan N, Viswanathan V, et al. Increasing Expenditure on Health Care Incurred by Diabetic Subjects in a Developing Country. Diabetes Care. 2007 Jan 26;30(2):252. [Internet] [cited 2016 Sep 20] Available from: http://www.ncbi.nlm.nih.gov/pubmed/17259490

40. Kumar A, Nagpal J, Bhartia A. Direct Cost of Ambulatory Care of Type 2 Diabetes in the Middle and High Income Group Populace of Delhi: DEDICOM Syrvey. J Assoc Physicians India. 2008;56:667–74. [Internet] [cited 2016 Sep 20] Available from: http://www.ncbi.nlm.nih.gov/pubmed/19086352

41. Akari S, Mateti UV, Kunduru BR. Health-care cost of diabetes in South India: A cost of illness study. J Res Pharm Pract. 2013;2(3):114–7. [Internet] [cited 2016 Sep 21] Available from: http://www.ncbi.nlm.nih.gov/pubmed/24991617

42. Chandra P, Gogate B, Gogate P, Thite N, Mutha A, Walimbe A. Economic Burden of Diabetes in Urban Indians. Open Ophthalmol J. 2014 Dec 31;8:91–4. [Internet] [cited 2016 Sep 19] Available from: http://www.ncbi.nlm.nih.gov/pubmed/25674186

43. Simpson SH, Corabian P, Jacobs P, Johnson JA. The cost of major comorbidity in people with diabetes mellitus. CMAJ Can Med Assoc J. 2003 Jun 24;168(13):1661–7. [Internet] [cited 2016 Sep 23] Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC161611/

44. Shobhana R, Rao PR, Lavanya A, Vijay V, Ramachandran A. Cost burden to diabetic patients with foot complications--a study from southern India. J Assoc Physicians India. 2000 Dec;48(12):1147–50. [Internet] [cited 2016 Sep 20] Available from: http://www.ncbi.nlm.nih.gov/pubmed/11280217

45. Kapur A. Economic analysis of diabetes care. Indian J Med Res. 2007 Mar;125(3):473–82. [Internet] [cited 2016 Sep 20] Available from: http://www.ncbi.nlm.nih.gov/pubmed/17496369

46. Stolar M. Glycemic control and complications in type 2 diabetes mellitus. Am J Med. 2010 Mar;123(3 Suppl):S3-11. [Internet] [cited 2016 Sep 20] Available from: http://www.ncbi.nlm.nih.gov/pubmed/20206730

47. WHO | Global Action Plan for the Prevention and Control of NCDs 2013-2020 [Internet]. WHO. [cited 2016 Aug 25]. Available from: http://www.who.int/nmh/events/ncd_action_plan/en/

48. WHO | From burden to “best buys”: Reducing the economic impact of NCDs in low- and middle-income countries [Internet]. WHO. [cited 2016 Aug 25]. Available from: http://www.who.int/nmh/publications/best_buys_summary/en/

49. Paycheck.in India - Definition of Unskilled, Semi-skilled, Skilled & Highly Skilled Workers [Internet]. [cited 2016 Sep 3]. Available from: http://www.paycheck.in/main/salary/minimumwages/definition-of-unskilled-semi-skilled-skilled-highly-skilled-workers

ANNEXURE1

INFORMATION SHEET

Title of the study: "A cross-sectional study to assess the out-of-pocket expenditure on Diabetes Mellitus among the urban population of Thoothukudi district, Tamilnadu, India - 2016"

Diabetes Mellitus is one of the chronic non-communicable diseases occurring world-wide. Its prevalence is rapidly increasing not only in industrialized countries but also in developing countries like India. This rapid rise can be attributed to obesity, unsatisfactory diet, sedentary lifestyle and increasing urbanization.

If this disease is not diagnosed and treated early, it can affect every system in the body. The complications of diabetes are many leading to disability and death. The health-care expenditure is also high and it further increases with complications and co-morbidities. Many diabetic patients prefer private health sector over government sector.

This study was intended to estimate the health-care expenditure on diabetes by the diabetic patients in private health sector. People should be aware that screening for diabetes regularly after the age of 30 can diagnose the disease early and thus prevents its complications, thereby reducing the disease morbidity, mortality and cost of diabetic illness. We request you to participate in this study.

The privacy of the participants in the research will be maintained throughout the study. In the event of any publication or presentation resulting from the research, no personally identifiable information will be shared. Taking part in this study is voluntary. You are free to decide whether to participate in this study or to withdraw at any time.

The results of the special study may be intimated to you at the end of the study period or during the study if anything is found abnormal which may aid in the management, treatment or prevention.

ஆய்வுதகவல்தாள்

“தூத்துக்குடி நகர்புறத்தில் வாழுமநீரிழிவுநோயாளிகள் தங்கள் நீரிழிவு நோய்க்காக செய்யும் செலவுகள் பற்றிய ஓர் ஆய்வு”

நீரிழிவு நோய் (சர்க்கரைநோய்) தொற்றா நோய்களுள் ஒன்று. இந்தநோயின் தாக்கமானது தொழில் மயமாக்கப்பட்ட நாடுகளில் மட்டுமல்லாது இந்தியா போன்ற வளர்ந்து வரும் நாடுகளிலும் விரைவாக அதிகரித்துவருகிறது. இதற்கு முக்கிய காரணங்களாக உடல்பருமன், மாறிவரும் உணவு பழக்கங்கள், உடல் உழைப்பில்லாத வாழ்க்கைமுறை, ஆகியவை கூறப்படுகிறது.

இந்தநோய் ஆரம்பித்திலேயே கண்டுபிடிக்கப்பட்டு சிகிச்சை அளிக்கப்படவில்லை என்றால், கிட்டத்தட்ட எல்லா உடல் உறுப்புகளையும் பாதித்துவிடும். இந்தநோயின் விளைவுகள் பலவிதமான இயலாமைக்கும் மரணத்திற்கும் வழிவகுக்கிறது. இந்தநோயின் பின்விளைவுகள் ஏற்படும்போது, அதற்காக செய்யப்படும் செலவுகளும் அதிகமாகிறது. பெரும்பாலானோர் அரசுமருத்துவமனைகளை விட தனியார் மருத்துவமனைகளையே விரும்புகின்றனர்.

ஒரு நீரழிவுநோயாளி தன் ஆரோக்கியத்திற்காக தனியார் சுகாதாரத் துறையில் எவ்வளவு செலவிடுகிறார் என்பதைக் குறித்தே இந்த ஆராய்ச்சி மேற்கொள்ளப்படுகிறது.

நீங்கள் இந்த ஆராய்ச்சியில் பங்கேற்க நாங்கள் விரும்புகிறோம்.

இந்தஆராய்ச்சியின் முடிவுகளை அல்லது கருத்துக்களை வெளியிடும் போதோ அல்லது ஆராய்ச்சியின் போதோ தங்களது பெயரையோ அல்லது அடையாளங்களையொ வெளியிடமாட்டோம் என்பதையும் தெரிவித்துக் கொள்ளுகிறோம்.

இந்த ஆராய்ச்சியில் பங்கேற்பது தங்களுடைய விருப்பத்தின் பேரில் தான் இருக்கிறது. மேலும் நீங்கள் எந்நேரமும் இந்த ஆராய்ச்சியிலிருந்து பின்வாங்கலாம் என்பதையும் தெரிவித்துக் கொள்கிறோம்.

ANNEXURE 2

INFORMED CONSENT FORM

Title of the study:

"A cross-sectional study to assess the out-of-pocket expenditure on Diabetes Mellitus among the urban population of Thoothukudi district, Tamilnadu, India-2016"

Name of the participant: **Age/Sex:**

(1) I have been explained in detail about the study and its procedure. I confirm that I had completely understood the study and have had the opportunity to ask questions

(2) I understand that my participation in the study is voluntary and that I am free to withdraw at any time, without giving any reason, without their medical care or legal rights being affected.

(3) I understand that the principal investigator, others working on the investigator's behalf, the Ethics Committee and the regulatory authorities will not need my permission to look at my health records both in respect of the current study and any further research that may be conducted in relation to it, even if I withdraw from the trial. I agree to this access. However I understand that my identity will not be revealed in any information released to third parties or published.

(4) I agree not to restrict the use of any data or results that arise from this study provided such a use is only for scientific purpose(s).

(5) I agree to participate in the above study.

Signature of investigator Signature or Thumb impression of the participant
Date:

ஆய்வுஒப்புதல்கடிதம்

“தூத்துக்குடி நகர்ப்புறத்தில் வாழும் நீரிழிவுநோயாளிகள் தங்கள் நீரிழிவு நோய்க்காக செய்யும் செலவுகள் பற்றிய ஓர் ஆய்வு”

பெயர்: வயது: பால்:

ஆராய்ச்சிசேர்க்கைஎண்: தேதி:

இந்த ஆராய்ச்சியின் விவரங்களும் அதன் நோக்கங்களும் முழுமையாக எனக்குத் தெளிவாக விளக்கப்பட்டது.

எனக்கு விளக்கப்பட்ட விஷயங்களை நான் புரிந்து கொண்டு நான் எனது சம்மதத்தைத் தெரிவிக்கிறேன்.

இந்த ஆராய்ச்சியில் பிறரின் நிர்ப்பந்தமின்றி என் சொந்த விருப்பத்தின் பேரில் தான் பங்கு பெறுகிறேன். நான் இந்த ஆராய்ச்சியிலிருந்து எந்நேரமும் பின்வாங்கலாம் என்பதையும் அதனால் எந்தப் பாதிப்பும் ஏற்படாது என்பதையும் நான் புரிந்து கொண்டேன்.

இந்த ஆராய்ச்சியின் விவரங்களைக் கொண்ட தகவல் தாளைப் பெற்றுக் கொண்டேன். நான் என்னுடைய சுயநினைவுடன் மற்றும் முழு சுதந்திரத்துடன் இந்தமருத்துவ ஆராய்ச்சியில் என்னைச் சேர்த்துக் கொள்ள சம்மதிக்கிறேன்.

ஆராய்ச்சியாளரோ அல்லது அவரைச் சார்ந்தவர்களோ நெறிமுறைக்குழு உறுப்பினர்களோ நான் இந்த ஆராய்ச்சியிலிருந்து விலகினாலும் என்னுடைய அனுமதியின்றி எனது உடல்நிலை குறித்த தகவல்களை இந்த ஆராய்ச்சிக்கோ இது தொடர்பான வேறு ஆராய்ச்சிக்கோ பயன்படுத்திக் கொள்ள முடியும் என்பதைப் புரிந்து கொண்டு சம்மதம் அளிக்கிறேன். ஆனாலும் எனது அடையாளம் வெளியிடப்படமாட்டாது என்பதையும் புரிந்துகொள்கிறேன்.

இந்த ஆராய்ச்சியின் தகவல்களையும் முடிவுகளையும் அறிவியல் நோக்கத்திற்காக பயன்படுத்துவதற்கு நான் அனுமதிக்கிறேன். இந்த ஆராய்ச்சியில் பங்குபெற நான் சம்மதிக்கிறேன்.

ANNEXURE 3

"A CROSS-SECTIONAL STUDY TO ASSESS THE OUT-OF-POCKET EXPENDITURE ON DIABETES MELLITUS AMONG THE URBAN POPULATION OF THOOTHUKUDI DISTRICT, TAMILNADU, INDIA - 2016"

Family no: No. of diabetic patients in family: ID:

1. SOCIO-DEMOGRAPHIC DETAILS:

Name:

Date of birth: Gender: Male / Female / Others

Address with phone no:

Marital status: Married / widow / widower / separated / single

Religion :

Education:

Occupation:

Number of family members:

Monthly family income:

Economic status: Dependent / Independent

Diet: Vegetarian / Mixed

Habits: Alcohol / Smoking / Tobacco chewing / None

Height - Weight -

2.CLINICAL DETAILS:

1. Family history of DM: 1. Yes 2. No

If yes, a) Father b) Mother c) Both parents d) Siblings e) Others

2. How have you been diagnosed as diabetic?

a. Accidental b. Incidental (due to complications)

3. Age at onset of diagnosis _____

4. Type of diabetes a) Type I (NIDDM) b) Type II (IDDM) c) Not mentioned

5. Are you suffering from any of the following co morbidities? If yes, duration and give your current treatment modality.

a. High blood pressure
b. High cholesterol levels
c. Thyroid disorders
d. If others, specify _____

6. Are you suffering from any of the following diabetes complications? If yes, duration and give your current treatment modality.

a. Kidney problems
b. Heart problems
c. Foot complications
d. Problems in vision
e. Neurological complications
f. Others _____

7. Which health service provider do you prefer for your diabetic check-up? Give your reason.

a) Government b) Private Reason _____

8. How often do you go for your diabetic check-up?

a)Once in a month b)Once in 2 months c)Once in 3 months d)As and when needed

Reasons for less frequent visits _____

3. DETAILS ON EXPENDITURE:

1. Have you taken any leave from your work during the last 3 months due to diabetic illness?

If yes, No. of days _____

Wages lost ____

Did your caregiver take leave from his/her work when you are ill during the last 3 weeks?

If yes, No. of work days lost for your caregiver _____

Wages lost ____

2. Did you take leave from your work for visiting your doctor during the last 3 months?

If yes, expenditure incurred for losing your one day work _____

3. How many times have you visited your doctor during the last 3 months?

4. Who accompanied you for visiting your doctor during the last 3 months?

Did that person take leave from his/her work for accompanying you?

If yes, expenditure incurred for that person for losing one day work___

5. Consultation charges during the last 3 months –

Whom did you consult for diabetes during the past three months?

a. General practitioner b. Diabetologist c. Cardiologist d. Nephrologist e.Ophthalmologist f. If others, specify _____

6. EXPENDITURE ON MEDICINES DURING THE LAST 3 MONTHS:

DRUG	CLASS	DURATION	DOSE	COST

7. LAB INVESTIGATION CHARGES DURING THE LAST 3 MONTHS:

INVESTIGATION	Yes/No	FREQUENCY	COST	RECENT VALUE AND DATE
Blood sugar				
HBA1C				
Lipid profile				
Blood urea				
Serum creatinine				
Urine – Albumin, sugar, deposit				
Others				

8. Expenditure on imaging modalities during the last 3 months: _____

(USG, X-Ray, CT Scan, MRI, ECG, ECHO, Biothesiometry, Others _____)

9. How much did you spend for transport during your last 3 months (to and fro)?

10. Have you been hospitalized during the past 3 months? Yes / No. If yes,

1. Which complication led to hospitalization? _____
2. Number of days admitted in hospital _____
3. Have you undergone any procedure due to diabetic complication? Yes / No
    a) If yes, details _____
    b) Lab charges _____
    c) Medical consultations ____
    d) Hospitalization charges ___
    e) Other investigations _____
    f) Transportation charges ___
    g) Surgery cost _____
4. Have your hospitalization charges been covered under any insurance? Yes / No

11. EXPENDITURE ON SELF TESTING LAST 3 MONTHS:

Cost of glucose monitoring device:

Frequency of testing:

Cost of strip:

Cost of syringe:

Total cost for 3 months:

12. How much did you spend on extra nursing care at home per month?

13. Expenditure on physical activity:

Time spent on physical activity _____

Do you spend money for physical activity? Yes / No

If yes, Type of physical activity _____ and Expenditure _____

14. How much did you spend on diabetic diet during the last 3 months?

15. Was there any previous hospital admission or any treatment that required a large sum of money other than the last three months?

If yes, Reason _____

Expenditure incurred _____

16. Mode of payment of hospital bills:

1. Personal savings
2. Medical insurance
3. Company reimbursement
4. Borrowing loan
5. Mortgage
6. Selling property

17. Do you think expenditure for Diabetes is curtailing your other expenses? Yes / No

ANNEXURE 4

REVISION OF MODIFIED BG PRASAD SCALE

The BG Prasad scale was formulated in 1961 keeping the base of Consumer Price Index (CPI) for 1960 as 100. This was revised in 1982 by introducing a linking factor of 4.93 to convert CPI (1982) from the new base of 100 to the old base CPI (1960). Again a need was felt in 2001 to revise the base, which was done by introducing the linking factor of 4.63. These linking factors have been given by the Labour Bureau. To calculate the new income values, first we have to find out the current All India Consumer Price Index (AICPI) for industrial workers (IW; base 2001 = 100). Then we have to calculate the multiplication factor and new income value which is given by the following equation:

Multiplication factor = Current index value/base index value in 2001 (i.e., 100). New income value = Multiplication factor × old income value × 4.63 × 4.93

Revised BG PRASAD Scale for May 2016

CLASS	SOCIO ECONOMIC STATUS	INCOME RANGE	NEW INCOME RANGE
I	**UPPER CLASS**	>= ₹ 100	>= ₹ 6277
II	UPPER MIDDLE CLASS	₹ 50 - ₹ 99	₹ 3139 - ₹ 6276
III	MIDDLE CLASS	₹ 30 - ₹ 49	₹ 1883 - ₹ 3138
IV	LOWER MIDDLE CLASS	₹ 15 - ₹ 29	₹ 942 - ₹ 1882
V	LOWER CLASS	< ₹ 15	<= ₹ 941

ANNEXURE 5

SAMPLING FRAME

FIRST STAGE:

S.no	Zones in Thoothukudi Corporation	Total number of wards
1	North	15
2	West	14
3	South	13
4	East	18

SECOND STAGE – NORTH ZONE:

S.no	Ward number	Population as per census 2001
1	1	3352
2	2	3495
3	3	7083
4	4	7394
5	5	4704
6	6	6832
7	7	3961
8	8	4087
9	9	3697
10	10	5337
11	11	5298
12	12	4502
13	13	4133
14	17	5153
15	18	6370

SECOND STAGE – EAST ZONE:

S.no	Ward number	Population as per census 2001
1	14	5646
2	15	4562
3	16	7104
4	19	6222
5	20	6029
6	21	6913
7	22	3834
8	23	4454
9	24	6202
10	25	6483
11	26	5488
12	27	3548
13	28	3660
14	29	4446
15	30	3827
16	31	3678
17	32	5135
18	33	5252

ANNEXURE 6

INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE, CHENNAI 600 003

EC Reg.No.ECR/270/Inst./TN/2013
Telephone No.044 25305301
Fax: 011 25363970

CERTIFICATE OF APPROVAL

To
Dr.D.Gracy Paulin
Post Graduate in M.D. Community Medicine
Madras Medical College
Chennai 600 003

Dear Dr.D.Gracy Paulin,

The Institutional Ethics Committee has considered your request and approved your study titled **"A CROSS-SECTIONAL STUDY TO ASSESS THE OUT-OF-POCKET EXPENDITURE ON DIABETES MELLITUS AMONG THE URBAN POPULATION OF THOOTHUKUDI DISTRICT, TAMIL NADU, INDIA - 2016 " NO. 21042016.**

The following members of Ethics Committee were present in the meeting hold on **05.04.2016** conducted at Madras Medical College, Chennai 3

1.Dr.C.Rajendran, MD.,	:Chairperson
2.Dr.Isaac Christian Moses,MD.Ph.D.Dean(FAC)MMC,Ch-3	:Deputy Chairperson
3.Prof.Sudha Seshayyan,MD., Vice Principal,MMC,Ch-3	: Member Secretary
4.Prof.B.Vasanthi,MD., Prof.of Pharmacology.,MMC,Ch-3	: Member
5.Prof.P.Raghumani,MS, Prof. of Surgery,RGGGH,Ch-3	: Member
6. Prof.Md.Ali,MD.,DM.,HOD-MGE, MMC,Ch-3	: Member
7.Prof.Baby Vasumathi, Director, Inst. of O&G,Ch-8	: Member
8.Prof.K.Ramadevi,MD, Director,Inst.of Bio-Chem,MMC,Ch-3	: Member
9.Prof.M.Saraswathi,MD.,Director, Inst.of Path,MMC,Ch-3	: Member
10.Prof.Srinivasagalu,Director,Inst.of Int.Med.,MMC,Ch-3	: Member
11.Tmt.J.Rajalakshmi, JAO,MMC, Ch-3	: Lay Person
12.Thiru S.Govindasamy, BA.,BL,High Court,Chennai	: Lawyer
13.Tmt.Arnold Saulina, MA.,MSW.,	:Social Scientist

We approve the proposal to be conducted in its presented form.

The Institutional Ethics Committee expects to be informed about the progress of the study and SAE occurring in the course of the study, any changes in the protocol and patients information/informed consent and asks to be provided a copy of the final report.

Member Secretary - Ethics Committee

MEMBER SECRE...
INSTITUTIONAL ETHICS COM...
MADRAS MEDICAL COLLEGE
CHENNAI-600 003

ANNEXURE 7

THOOTHUKUDI CITY MUNICIPAL CORPORATION

Phone No. 0461- 2326901-903
Email: comm@thoothukudicorp.gov.in
Fax No. 0461-2320457

From
City Health Officer
Thoothukudi Corporation.

To
Dr. D.Gracy Paulin
II Year Post Graduate,
M.D. Community Medicine,
Institute Of Community Medicine
Madras Medical College,
Chennai-03.

H1/20743/12 **Dated: 28.03.2016**

Sir,

Sub: Permission granted to conduct study in Diabetic Patients in Thoothukudi Corporation - Urban Areas - Regarding

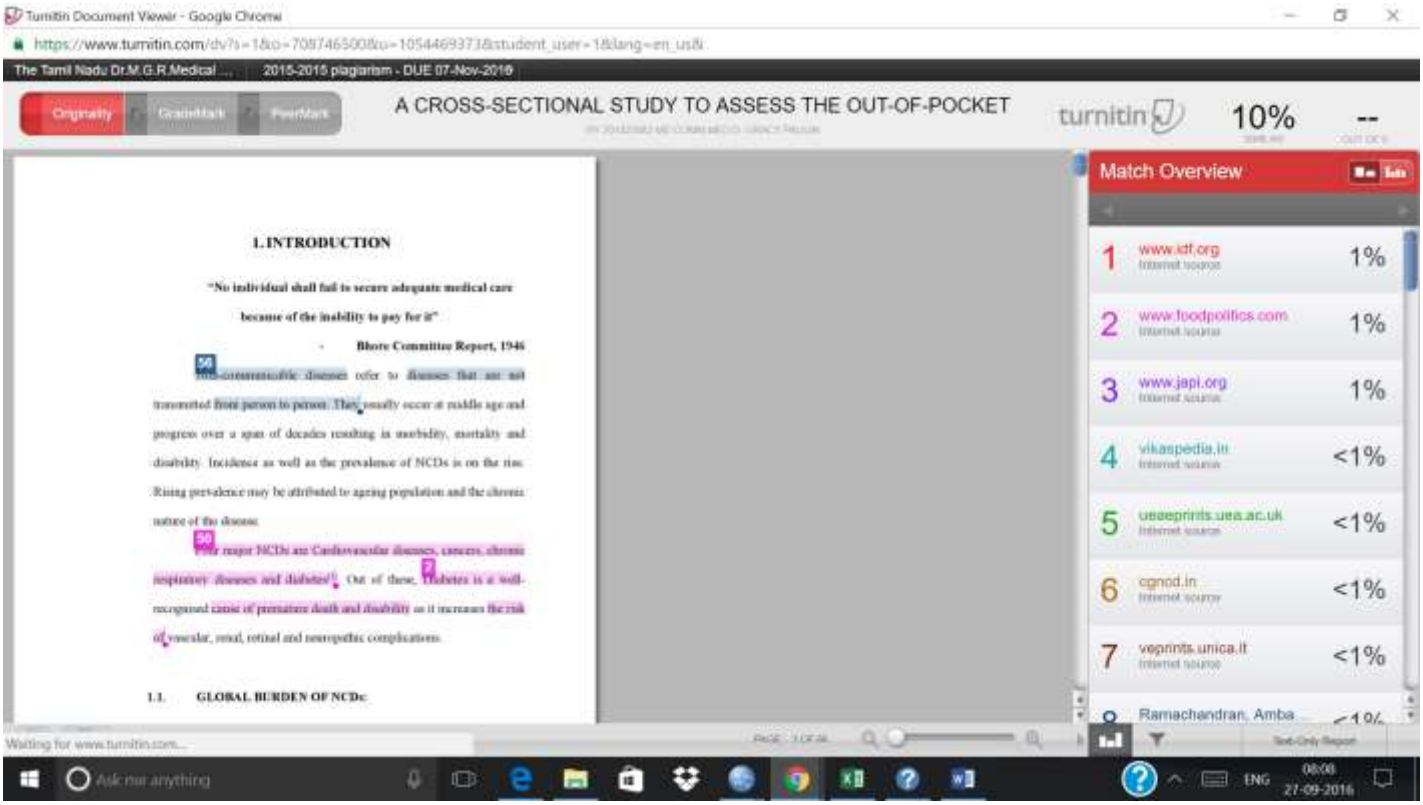
Ref: Dr. D.Gracy Paulin, II Year Post Graduate, Madras Medical College, Chennai letter dated 15.02.2016.

With reference to your letter above, seeking permission to conduct A cross-sectional study to assess the out-of-pocket expenditure on, in Diabetes Mellitus among the urban population of Thoothukudi District, Tamilnadu, India-2016 in Thoothukudi Corporation is granted.

CITY HEALTH OFFICER
THOOTHUKUDI CORPORATION

28/3/16

ANNEXURE 8


Turnitin Document Viewer - Google Chrome
https://www.turnitin.com/dv?s=1&o=708746508&u=1054469373&student_user=1&lang=en_us&
The Tamil Nadu Dr.M.G.R.Medical ...
2015-2015 plagiarism - DUE 07-Nov-2016
Originality
Grademark
Peermark
A CROSS-SECTIONAL STUDY TO ASSESS THE OUT-OF-POCKET
turnitin
10%
--
1. INTRODUCTION
"No individual shall fail to secure adequate medical care because of the inability to pay for it"
Bhore Committee Report, 1946
Non-communicable diseases refer to diseases that are not transmitted from person to person. They usually occur at middle age and progress over a span of decades resulting in morbidity, mortality and disability. Incidence as well as the prevalence of NCDs is on the rise. Rising prevalence may be attributed to ageing population and the chronic nature of the disease.
Four major NCDs are Cardiovascular diseases, cancers, chronic respiratory diseases and diabetes[1]. Out of these, Diabetes is a well-recognized cause of premature death and disability as it increases the risk of vascular, renal, retinal and neuropathic complications.
1.1. GLOBAL BURDEN OF NCDs:
Match Overview
1 www.idf.org 1%
2 www.foodpolitics.com 1%
3 www.japi.org 1%
4 vikaspedia.in <1%
5 ueaeprints.uea.ac.uk <1%
6 cgnod.in <1%
7 veprints.unica.it <1%
8 Ramachandran, Amba... <1%
Waiting for www.turnitin.com...
Ask me anything
ENG
08:00
27-09-2016

ANNEXURE 9

KEY TO MASTER CHART

VARIABLE	LABEL	CODING
HOUSEHOLD	Number of the household visited	
DIAB PATIENTS	Number of diabetic patients in the household	
NAME	Name of the diabetic individual	
AGE	Age of the individual	
SEX	Sex of the individual	1 – male 2 – Female
MARITAL STAT	Marital status of the individual	1 – Married 2 – Widow 3 – Widower
RELIGION	Religion of the individual	1 – Hindu 2 – Christian 3 – Muslim
EDUCATION	Educational status of the individual	1 – Illiterate 2 – Primary 3 – Secondary 4 – Higher secondary 5 – Diploma 6 – Degree
OCCUPATION	Occupational status of the individual	1 – Currently not working 2 – Unskilled 3 – semiskilled 4 – Skilled 5 – Professional 6 – Landlord / Shop-owner
NO OF FAMILY MEM	Number of family members in the household	

INCOME	Monthly family income	
ECONOMIC STATUS	Economic status of the individual	1 – Dependent 2 – Independent
DIAGNOSIS	Voluntary diagnosis of the disease	1 – no 2 – Yes
DURATION	Time elapsed since diagnosis of the disease	
TYPE	Type of diabetes	1 – IDDM 2 – NIDDM
COMORBIDITIES	Number of co-morbidities	1 – None 2 – One 3 – Two 4 – Three
COMPLICATIONS	Number of complications	0 – None 1 – one 2 – two
COMP TYPE	Complication the individual has	1 – Nephropathy 2 – CAD 3 – Diabetic ulcer 4 – Retinopathy 5 – Neuropathy 6 – Presenile cataract 7 – CVA 9 – More than 2 complications
HSP	Health service provider for the individual	1 – Both 2 – Government 3 – Private
CHECKUP	Frequency of diabetic checkup	0 – once in a month 1 – once in 2 months 2 – once in 3 months 3 – as and when needed
CONSULTATION COST	Consultation charges for the last three months	
TREATMENT	Type of antidiabetic treatment	0 – None 1 – Alternative medicine 2 – OHA alone 3 – OHA and insulin 4 – Insulin alone
MEDICINE COST	Medicinal costs for the last three months	
CONTROL	Blood glucose control status	1 – Not known 2 – Under control

		3 – Poor control
FREQ OF BLOOOD INV	Number of blood glucose testing done during the last three months	
INVESTIGATION COST	Investigation cost for the last three months	
TRANSPORTATION COST	Transportation Cost	
HOSPITALIZATION	Hospitalization during the last three months	1 – No 2 – Yes
HOSPITALIZATION COST	Total cost of hospitalizaion	
SELF MONITORING	Self monitoring of blood glucose	1 – No 2 – Yes
SELF MONITORING COST	Cost of self monitoring for the last three months	
ENC COST	Cost of extra nursing care during the last three months	
PA	Physical activity	1 – No 2 – Yes
PA COST	Money spent on physical activity	
DIET	Diet modification	1 – No 2 – Yes
DIET COST	Cost for diet modification	
MDL	Man days lost for caregiver/patients	
INDRECT COST	Indirect cost due to absenteeism	
COPING MECH	Coping mechanism when the healthcare expenditure increases	1 – Personal savings 2 – Medical insurance 3 – Company reimbursement 4 – Borrowing loan 5 – Selling property 6 - Mortgage

ANNEXURE 10

	HOUSEHOL	DIAB	PATIE	NAME	AGE	SEX	MARITAL S	RELIGION	EDUCATIO	OCCUPATIO	NO OF FAM	INCOME	ECONOMIC	DIAGNOSIS	DURATION	TYPE	COMORBID	COMPLICA	COMP TYPE	HSP	CHECKUP			
	CONSULTA	TREATMEN	MEDICINE	CONTROL	FREQ OF BL	INVESTIGA	TRANSPORT	HOSPITALI																
1	1 VELAYUTHA	58	1	1	1	6	3	6	17000	2	2	26	2	3	1	5	3	0	450	3	3000	3	2	
2	1 RAZUL	45	1	1	3	2	4	3	20000	2	2	5	2	3	0	0	3	0	300	2	800	3	1	
3	1 CHANDRA	56	2	1	2	4	1	6	40000	2	2	3	2	2	0	0	3	3	150	2	257	2	1	
4	1 MERCY	55	2	1	2	3	1	6	20000	1	2	10	2	2	1	2	3	3	150	2	982	3	1	
5	2 ALAGESAN	62	1	1	1	6	6	4	20000	2	2	17	2	3	0	0	3	2	50	3	2050	2	1	
5	2 CHRISTY	54	2	1	1	5	1	4	20000	1	2	2	2	1	0	0	3	3		2	240	1	0	
6	2 DHANARAJ	72	1	1	2	6	1	2	10000	2	2	3	2	1	1	2	3	2	250	2	1500	2	1	
6	2 ESTHER	68	2	1	2	4	1	2	15000	1	2	18	2	2	0	0	3	2	150	3	3495	2	1	
7	1 CHANDRAS	63	1	1	2	5	4	4	30000	2	1	7	2	3	2	9	3	1	150	2	3996	2	1	
8	1 DHARMALI	60	1	1	2	6	1	3	25000	1	1	7	2	2	0	0	3	0	450	2	1974	2	2	
9	2 VIJAY	60	1	1	1	6	1	4	18000	2	1	10	2	2	1	2	3	3	250	2	3495	2	1	
9	2 VERONIKA	58	2	1	1	6	1	4	20000	2	2	1	2	1	0	0	3	3		0	0	1	0	
10	1 RAJENDRAN	57	1	1	1	3	4	3	25000	2	2	3	2	1	0	0	3	3	100	2	397	2	1	
11	2 INDIARAJ	57	1	1	1	3	4	7	17000	2	1	10	2	1	1	3	3	1	200	3	1765	3	1	
11	2 SHANTHI	47	2	1	1	2	1	7	20000	1	1	1	2	1	0	0	3	0	450	2	909	2	2	
12	1 ANNAMAR	71	2	2	1	2	1	1	5000	2	2	16	2	2	1	5	3	1	80	3	2685	2	1	
13	1 GOPAL	65	1	1	1	2	4	4	15000	2	2	25	2	2	1	3	3	0	600	3	3462	3	3	
14	1 MANOHAR	47	1	1	1	4	4	5	50000	2	1	15	2	3	1	4	3	0	650	2	2418	2	3	
15	2 ABDUL KHA	65	1	1	3	5	1	2	5000	2	2	2	2	1	0	0	3	2		2	600	1	0	
15	2 MOHAMM	60	2	1	3	2	1	2	10000	1	1	6	2	2	0	0	3	2		2	800	1	0	
16	1 REX AMALI	61	2	2	1	3	1	1	1500	1	2	2	2	1	0	0	3	2		2	540	1	0	
17	1 RAMESH	38	1	1	1	6	4	4	15000	2	2	4	2	1	0	0	3	3	150	2	450	3	1	
18	1 JEYAKUMA	68	1	1	1	5	1	3	18000	2	1	20	2	2	1	3	3	0	450	2	2175	3	1	
19	1 KATTITHAN	68	2	1	1	2	1	2	12000	1	1	24	2	1	1	2	3	1	150	2	1055	2	3	
20	2 VIJAYAKUM	46	1	1	1	6	6	5	50000	2	1	8	2	2	0	0	3	3	150	2	423	3	1	
20	2 SOUNDARA	73	1	3	1	4	1	5	40000	2	1	3	2	2	1	2	3	1	250	2	2196	3	1	
21	1 JESSI	55	2	1	2	3	1	5	50000	1	2	3	2	1	0	0	3	1	150	2	405	3	1	
22	1 ABRAHAM	71	1	1	2	2	2	2	2500	2	1	5	2	2	0	0	3	0	300	2	320	2	1	
23	1 STALIN	46	1	1	1	5	4	6	30000	2	2	0	2	3	0	0	3	2	200	2	1005	2	1	
24	2 ARUMUGA	65	1	1	1	5	1	4	22000	2	2	11	2	1	0	0	3	0	400	2	2134	2	2	
24	2 SHANMUH	64	2	1	1	5	1	4	20000	2	2	6	2	2	0	0	3	2	750	2	3325	3	1	
25	1 PREMA	61	2	1	1	5	1	5	20000	1	1	11	2	1	0	0	3	0	1500	2	189	2	2	
26	1 ARASAMM	50	2	2	1	2	1	5	15000	1	1	8	2	1	1	3	3	0	450	2	3006	3	2	
27	1 SAROJA	56	2	2	1	3	2	4	18000	2	1	5	2	1	0	0	3	2	200	2	2472	3	1	
28	1 KUMARAVE	60	1	1	1	3	4	2	10000	2	1	6	2	1	0	0	3	3	450	2	270	3	1	
29	1 KANNAMM	65	2	2	1	3	1	4	40000	2	1	10	2	1	0	0	2	0	0	2	0	2	1	
30	1 JEYARAJ	65	1	1	1	4	1	4	20000	2	1	23	2	3	1	5	3	1	300	2	1886	2	2	
31	1 KAMALAM	82	2	2	1	3	1	4	50000	2	1	8	2	2	2	9	3	2	200	2	2200	3	1	
32	1 SHANMUGA	43	2	1	1	6	5	5	30000	2	1	8	2	3	0	0	3	2	200	2	719	2	1	
33	1 CHRISTOPH	58	1	1	2	6	4	5	40000	2	2	5	2	2	0	0	3	1	400	2	742	2	1	
34	1 PANKAJAM	74	2	2	1	3	1	5	70000	1	2	18	2	4	0	0	3	0	1000	2	5150	3	2	
35	1 VIOLA	50	2	1	1	6	5	4	35000	2	1	0	2	1	0	0	2	0	0	2	0	3	1	
36	2 JOHN	67	1	1	2	4	1	6	15000	2	2	3	2	2	0	0	3	3	150	2	257	2	1	
36	2 CHANDRA	59	2	1	2	3	1	6	25000	1	2	1	2	1	0	0	3	3		2	100	1	0	
37	1 PUSHPAM	55	2	2	1	2	1	4	25000	1	1	10	2	2	2	9	3	3	150	2	599	3	1	
38	1 MANIDEVI	49	2	1	1	3	1	6	24000	1	2	10	2	1	0	0	3	2	150	2	750	3	1	
39	1 GUNASEKA	60	1	1	1	6	1	5	20000	2	2	26	1	1	1	2	3	2	300	3	2134	3	1	
40	1 JEBAKUMA	64	1	1	1	5	1	4	15000	1	1	19	2	3	1	4	3	2	150	3	2082	2	1	
41	1 INDRANI	55	2	2	1	3	2	4	10000	1	1	5	2	3	0	0	3	3	200	2	1371	2	1	
42	1 MAHESWA	45	2	2	1	2	3	5	15000	2	1	10	2	2	1	6	2	2	0	2	0	3	1	
43	1 CHARLES	60	1	1	2	6	1	5	40000	1	1	7	2	2	1	3	3	2	500	2	1000	3	3	
44	1 RAJESHWA	41	2	2	1	3	1	5	16000	1	1	7	2	2	0	0	3	2	200	2	756	3	1	
45	2 RAJAN	57	1	1	1	6	4	3	30000	2	2	9	2	1	1	1	3	2	250	2	2082	2	1	
45	2 KUPPAMM	53	2	1	1	4	1	3	35000	1	1	11	2	2	1	2	3	2	500	2	2478	3	1	
46	1 PALANIVEL	53	1	1	1	5	4	5	40000	2	1	8	2	3	1	3	3	2	0	2	700	2	1	
47	1 KAVITHA	25	2	1	1	2	1	5	10000	1	1	2	2	1	0	0	2	3	0	2	0	1	1	
48	1 JAYASHAN	48	1	1	1	6	4	4	50000	2	1	7	2	2	1	3	3	0	600	2	720	2	1	
49	1 UTHRAKAN	58	2	1	1	2	1	5	12000	1	1	2	2	2	0	0	2	0	0	2	0	2	2	
50	1 KARUPASA	50	1	1	1	3	4	5	20000	2	1	3	2	2	0	0	1	0	0	2	826	2	3	
51	1 LAKSHMIK	52	2	1	1	6	5	4	90000	2	1	5	2	3	2	9	3	2	700	2	2310	2	1	
52	1 MANJULAD	46	2	1	1	4	1	4	12000	1	1	6	2	1	0	0	3	1	150	2	198	3	1	
53	1 LATHA	43	2	1	1	4	1	4	20000	1	1	2	2	3	0	0	3	3	150	2	768	3	1	
54	2 MAHARAJ	73	1	3	1	3	1	6	45000	2	1	7	2	1	0	0	3	0	300	2	198	2	1	
54	2 CHANDRAL	59	2	1	1	3	1	6	60000	1	1	6	2	3	0	0	3	3	150	2	745	1	1	
55	1 JEBASTIAN	49	1	1	2	4	6	4	20000	2	2	6	2	2	0	0	3	1	300	2	299	2	2	
56	1 VALLIKODI	50	2	1	1	1	1	5	10000	1	1	5	2	1	1	1	3	3	150	2	899	3	1	
57	1 ANGUSAMY	55	1	1	1	3	6	3	20000	2	1	6	2	2	1	5	3	0	600	2	2046	3	3	

58	1 GNANARAJ	65	1	1	1	2	1	6	20000	2	1	25	2	1	0	0	3	3	150	2	3150	2	1
59	1 SELVARAJ	65	1	3	1	2	1	6	15000	1	1	15	2	1	0	0	3	0	200	2	1800	3	1
60	3 KANNAN	39	1	1	1	3	4	6	30000	2	1	1	2	2	0	0	3	0	300	2	997	3	2
60	3 PREMALAT	37	2	1	1	4	1	6	35000	1	1	12	2	1	0	0	3	0	300	2	120	3	1
60	3 SORNAM	68	2	2	1	2	1	6	25000	1	1	5	2	1	0	0	3	3	0	2	204	3	1
61	3 CHELLAPAN	67	1	1	1	2	1	6	30000	1	1	10	2	1	1	4	3	0	300	2	200	3	1
61	3 THANGARA	63	2	1	1	1	1	6	30000	1	1	10	2	1	0	0	3	0	300	2	100	3	1
61	3 SUBAMMA	38	2	1	1	6	3	6	30000	2	1	0	2	1	1	3	3	1	150	2	910	3	2
62	1 RAJ	45	1	1	1	6	4	4	20000	2	1	2	2	1	0	0	3	0	300	2	360	3	2
63	2 KOVILMAN	70	1	1	1	2	1	6	30000	1	1	5	2	1	1	2	3	1	200	2	1426	2	1
63	2 SELVI	37	2	1	1	6	2	6	35000	2	2	1	2	1	0	0	3	3	150	2	129	2	3
64	1 PACKIALAK	56	2	1	1	2	1	4	50000	1	1	5	2	1	0	0	3	3	0	2	171	1	1
65	1 INDRA	55	2	1	2	3	2	3	12000	2	1	5	2	2	0	0	3	3	150	2	425	1	1
66	1 KANDASAM	66	1	1	1	2	4	5	20000	2	1	3	2	2	1	2	2	0		2		1	1
67	1 KSSAKIAM	55	2	2	1	2	4	2	10000	2	1	12	2	2	0	0	2	1		2		3	1
68	1 SHANMUGA	66	1	1	1	2	1	2	10000	2	1	3	2	2	1	2	3	2	200	2	2651	2	1
69	2 SIVAPERU	52	1	1	1	2	3	5	7000	2	1	1	2	1	0	0	2	0		2		3	1
69	2 CHANDRIKA	43	2	1	1	3	1	5	7000	1	1	1	2	1	0	0	2	0		2		3	1
70	2 GANESAN	42	1	1	1	2	4	5	27000	2	2	4	2	1	0	0	3	1	150	2	179	2	1
70	2 SELVIAMM	70	2	2	1	1	1	5	20000	1	1	20	2	1	1	4	3	3	0	0	0	1	1
71	1 RANGANAT	72	1	1	1	6	1	2	20000	2	1	36	2	2	0	0	3	0	300	4	3100	2	3
72	1 MARSIM	40	1	1	3	4	3	4	10500	2	1	6	2	1	0	0	3	1	300	2	744	3	1
73	1 KRISHNADE	65	1	3	1	2	1	1	1200	1	2	1	2	2	0	0	2	0		2		2	2
74	1 VEERASINA	75	2	2	1	1	1	2	7000	1	1	15	2	1	0	0	2	0		2		3	1
75	1 KOTTAIKAR	28	1	1	1	2	4	3	9000	2	2	3	2	1	0	0	3	2	150	2	824	2	1
76	1 CHINNADU	58	1	1	1	6	4	2	80000	2	1	8	2	3	1	5	3	2	300	3	7100	2	3
77	1 MARIAMM	65	2	1	1	2	1	5	15000	1	2	7	2	3	1	7	3	1	200	2	1939	2	1
78	1 KARUPASA	48	1	1	1	2	4	4	10000	2	1	3	2	1	0	0	3	0	300	2	788	3	2
79	1 VALLIKODI	53	2	1	1	2	1	2	30000	1	1	3	2	2	1	7	3	0	1500	2	4529	2	3
80	1 SELVIAMM	60	2	1	1	2	1	3	10000	1	2	2	2	2	0	0	3	0	200	2	501	2	1
81	1 PERIASAM	55	1	1	1	3	6	5	50000	2	1	1	2	1	0	0	3	0	300	2	1530	3	2
82	1 SUBBULAKS	72	2	2	1	1	1	5	15000	1	1	23	2	1	0	0	2	0		2		3	1
83	1 JANAKI	68	2	2	1	2	1	5	20000	1	1	8	2	2	0	0	3	2	150	2	824	3	1
84	2 SUBRAMA	47	1	1	1	5	4	4	25000	2	1	20	2	2	0	0	3	2	200	4	2681	2	1
84	2 RASATHI	40	2	1	1	6	5	4	30000	2	1	5	2	1	0	0	3	2	150	2	120	2	1
85	1 PRISILLA	82	2	2	2	2	1	3	10000	2	1	7	2	3	0	0	3	0	200	2	2120	3	2
86	2 JOHN JACO	69	1	3	2	3	1	5	25000	2	1	3	2	3	1	7	3	2	150	2	1870	3	1
86	2 SCINDIA	44	2	1	2	6	4	5	50000	2	1	1	2	1	0	0	3	2	150	2	124	2	1
87	1 PAUL THAN	58	2	1	2	2	1	5	7000	1	1	6	2	2	0	0	2	0		2		3	1
88	1 SELVALAKS	59	2	1	1	3	4	3	5000	2	1	24 NM		2	1	5	2	0		2		2	3
89	1 MEENATCH	42	2	1	1	4	3	3	20000	2	1	2	2	2	1	1	3	0	1500	3	4939	2	3
90	1 MARIMUT	47	1	1	1	3	4	4	12000	2	1	2	2	2	1	2	2	0		2		2	2
91	1 MARAGATH	59	2	1	1	3	1	3	7000	1	1	14	2	1	1	2	2	0		2		3	2
92	1 PUNITHAV	57	2	1	1	3	1	4	8000	1	2	15	2	1	1	5	3	0	300	2	405	2	2
93	1 SEETHALAK	62	2	1	1	3	6	1	5000	2	1	27	2	1	1	3	3	0	300	2	594	3	2
94	1 GOMATHI	55	2	1	2	4	4	3	15000	2	1	25	2	1	1	6	3	0	300	2	1557	3	2
95	1 SUNDARA	62	1	1	2	2	3	5	10000	2	2	7	2	3	0	0	3	0	300	2	1310	2	3
96	1 SUBBIAH	60	1	1	1	3	4	4	15000	2	1	20	2	3	0	0	3	0	450	2	1304	2	3
97	1 JAWAHAR	52	1	1	1	4	6	4	60000	2	1	7	2	2	1	2	3	0	900	2	2095	2	3
98	1 GNANASIGA	62	1	1	2	2	1	2	4000	1	1	5	2	1	1	2	3	0	200	3	2650	3	2
99	1 SHANTHI	50	2	1	1	3	1	2	8000	1	1	20	2	4	0	0	3	2	150	2	2899	2	1
100	1 ESTHER	68	2	1	2	2	1	2	10000	1	1	20	2	2	0	0	3	0	300	3	2032	3	2
101	2 JOSEPH	52	1	1	2	2	6	4	20000	2	1	2	2	1	0	0	3	3	0	2	513	1	0
101	2 REGINA	43	2	1	2	3	1	4	15000	1	1	3	2	2	0	0	3	3	0	2	513	1	0
102	2 WILLIAM	75	1	1	2	3	1	2	10000	2	1	22	2	1	0	0	3	3	150	2	120	2	1
102	2 HEPSI	71	2	1	2	2	1	2	7500	1	1	15	2	3	1	7	1	0	300	2		3	1
103	1 VARATHAR	44	1	1	1	3	2	6	20000	2	1	3	2	1	1	3	2	2		2		2	1
104	1 RANI	59	2	1	1	2	1	5	10000	1	1	6	2	1	0	0	3	0	450	2	800	2	1
105	1 CHANDRA	70	2	2	1	3	1	4	40000	2	1	25	2	1	0	0	3	0	400	2	873	2	1
106	1 YOGAMMA	65	2	1	1	2	1	2	5000	1	1	3	2	1	0	0	1	3		1	150	3	3
107	1 PARVATHY	59	2	2	1	2	1	5	20000	1	1	10	2	2	0	0	3	3	150	2	402	3	1

108	1 KANAGAM	70	2	2	1	2	1	4	20000	1	1	10	2	2	0	0	3	1	150	2	2
109	1 KASIMANI	69	2	2	1	2	1	5	25000	1	1	15	2	1	0	0	3	3	200	2	2
110	1 SHANKAR	50	1	3	1	2	3	5	20000	2	1	1	2	1	0	0	2	3	0	1	
111	1 KARUPASA	49	1	1	1	3	3	2	6000	2	1	4	2	2	1	2	1	1	400	2	18
112	1 CHANDRA	63	2	1	1	5	1	3	25000	2	1	15	2	3	0	0	3	1	400	3	21
113	2 MADURAPA	67	1	1	1	6	1	5	80000	2	2	22	2	1	0	0	3	3	0	4	15
113	2 DHANALAK	56	2	1	1	4	1	5	100000	1	2	11	2	1	1	5	3	3	0	4	10
114	1 SUBRAMAN	68	1	1	1	5	6	4	40000	2	1	26	2	3	1	2	3	3	0	2	55
115	1 AYYAKUMA	46	1	1	1	2	6	4	10000	2	1	6	2	1	1	2	2	0		2	
116	1 PACHAIYAP	71	1	1	1	2	1	5	4000	1	1	11	2	2	0	0	3	2	150	2	5
118	1 SURESH	50	1	1	1	4	6	3	9000	2	1	5	2	3	0	0	3	0	150	2	12
119	1 PRASHANT	45	1	1	1	2	3	5	10000	2	1	1	2	1	1	3	2	0		2	
120	1 CHELLATH	48	2	1	1	4	1	5	30000	1	1	5	2	1	1	3	3	3	300	2	6
121	1 BALAKRISH	43	1	1	1	6	4	4	20000	2	2	4	2	1	0	0	3	1	150	2	
122	1 MOOKAMM	56	2	1	1	2	1	4	30000	1	1	12	2	2	0	0	2	0		2	
123	2 SELVAM	55	1	1	1	5	3	4	20000	2	1	15	2	1	1	2	3	1	250	4	17
123	2 MALA	40	2	1	1	3	1	4	25000	1	1	0	2	3	0	0	2	0		2	
124	1 SUBRAMA	40	1	1	1	2	4	4	14000	2	1	7	2	1	0	0	2	3	0	0	
125	1 THILAGAVA	53	2	1	1	2	1	3	10000	1	1	1	2	3	0	0	2	0		2	
126	1 JEYAMARI	43	2	1	1	2	1	4	24000	1	1	7	2	2	0	0	2	0		2	
127	1 YESUDIAN	51	2	1	2	6	3	4	45000	2	2	15	2	1	0	0	1	0	300	2	
128	1 SUMATHI	60	2	1	1	2	1	5	20000	1	1	10	2	2	0	0	3	2	150	2	12
129	1 MUSEER B	62	2	1	3	2	1	5	10000	1	1	5	2	4	0	0	3	3	200	2	32
130	1 PACKIAM	60	2	1	1	4	1	4	45000	1	1	17	2	2	0	0	3	1	200	4	25
131	2 RAMASAMY	74	1	1	1	6	1	4	20000	2	1	16	2	1	0	0	3	3	0	2	16
131	2 RAJESHWA	67	2	1	1	5	1	4	20000	2	1	11	2	1	0	0	3	3	0	2	1
132	1 JAYA RAMA	62	2	2	1	2	1	5	20000	1	1	13	2	1	0	0	3	2	150	2	8
133	1 KARUPPASA	54	1	1	1	3	6	4	15000	2	1	15	2	1	0	0	3	3	150	2	1
134	1 KOMALA	47	2	1	1	2	1	5	15000	1	1	1	2	2	0	0	3	2	200	2	9
135	1 RAVICHAN	75	1	1	1	3	3	6	10000	2	1	15	2	3	0	0	2	2		2	
136	1 ARUMUGA	40	1	1	1	3	3	4	23000	2	1	3	2	1	0	0	3	1	150	2	8
137	1 RAMALING	50	1	1	1	3	3	4	18000	2	1	2	2	1	0	0	3	1	150	2	2
138	1 SANKAR	38	1	1	1	2	2	6	15000	2	1	3	2	1	0	0	2	0		2	
139	1 NARAYANA	50	1	1	1	3	4	6	20000	2	1	5	2	2	1	2	3	1	300	2	18
140	1 SARASWAT	39	2	1	1	2	2	4	20000	2	1	3	2	1	0	0	2	0		2	
141	2 ARUMAINA	64	1	1	1	5	1	5	30000	2	1	5	2	2	1	5	2	0		2	
141	2 SHANTHINI	59	2	1	1	4	1	5	30000	1	1	5	2	1	0	0	2	0		2	
142	1 KARUPPASA	55	1	1	1	5	4	4	15000	2	2	8	2	2	0	0	2	0		2	
143	1 SUBBULAK	41	2	1	1	2	1	3	18000	1	1	6	2	3	0	0	2	0		2	
144	1 SUBRAMAN	58	1	1	1	5	3	4	20000	2	1	4	2	2	0	0	3	0	400	4	29
145	1 RAMESH	46	1	1	1	2	6	4	8000	2	1	3	2	1	1	3	2	0		2	
146	1 VENKATES	42	1	1	1	3	2	6	10000	2	1	2	2	1	1	4	3	1	400	2	3
148	1 PONNUTHA	58	2	1	1	2	1	5	24000	1	2	2	2	2	0	0	3	0	300	2	14
149	1 DHANARAJ	69	1	1	2	5	1	2	2000	2	1	10	2	2	1	2	2	0		4	21
150	1 NAINAR	63	1	3	1	5	1	5	15000	2	1	20	2	1	0	0	3	0	450	2	3
151	1 SIVAGNAN	61	2	1	1	2	1	4	25000	1	1	5	2	1	0	0	3	0	300	2	4
152	1 MANONMA	81	1	2	2	3	1	5	50000	2	1	30	2	3	0	0	3	1	500	2	13
153	2 PANEERSEL	52	1	1	1	6	2	4	20000	2	1	1	2	1	0	0	3	3		0	
153	2 PARVATHA	45	2	1	1	3	1	4	18000	1	1	4	2	2	0	0	3	3		2	2