

**ASSESSMENT OF HEALTH LITERACY AMONG T2DM ADULTS
RESIDING AT JAIPUR, RAJASTHAN.**

**A Capstone project submitted to
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the award of the degree of
Master of Public Health**

by
N. Meena kumari
MPH - Cohort V (2017-19)

Under the guidance of
Dr. Mohan Bairwa MD
Associate Professor
Institute of Health Research Management,
The IIHMR University, Jaipur, Rajasthan.

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CERTIFICATE BY THE GUIDE

This is to certify that the capstone entitled “assessment of health literacy among T2DM adults residing at Jaipur, Rajasthan” is a bonafide research work done by **Mrs. N. Meena kumari** in partial fulfillment of the requirement for the capstone of Master of Public Health

Date:01-10-2018
Place: Jaipur.

Dr. Mohan Bairwa MD
Associate Professor
Institute of Health Research Management,
The IIHMR University, Jaipur, Rajasthan.

ABSTRACT

Diabetes mellitus is a chronic disease caused by inherited or acquired deficiency in the production of insulin by the pancreas, or by an ineffectiveness of the insulin produced. There are 2 types of diabetes mellitus; type-1 and type -2. Type I diabetes mellitus (T1DM) developed mostly in children and adolescents. Type - 2 diabetes mellitus (T2DM) most frequently occurring in adults and accounts for around 90% of all diabetes cases worldwide. The epidemic of diabetes mellitus the International Diabetes Federation (IDF) estimated that 1 in 11 adults aged 20–79 years (415 million adults) had diabetes mellitus globally in 2015. The main drivers of the global epidemic of T2DM are the rise in obesity, a sedentary lifestyle, energy-dense diets and population ageing.

Health literacy (HL) is a measure of a patient ability to read, understand and to take decisions on medical instructions. Patients with inadequate HL have poorer health outcomes than those with adequate HL. Physicians typically do not have the time or resources to address these patient factors that may influence health outcomes for people with diabetes: adherence to treatment regimen, beliefs, attitudes, culture, understanding of the disease, language ability and health literacy, socioeconomic status, comorbidities, and social support. Diabetes self-management education (DSME) is considered essential for improving the prevention and care of diabetes through empowering patients to increase agency in their own health and care processes.

The major findings of this study were 58% of T2DM adults felt low support by health care providers, 50% of them have enough information and actively managing their health. 66% T2dm adults have good social support, half of the adults have felt health information in diabetic management was low and engaging low with healthcare workers and finally, they were not able to get good health information.

Habits in adults has significantly associated with understanding and support by healthcare workers and ability to find good health information, but education level in adults has significantly associated to actively managing their health and to engage with healthcare providers., similarly, age of T2DM adults has significantly associated to get social support, navigating the health care system and to understand health information well enough to know what to do.

The diabetic management is art but blended with science. This study proven that health literacy is needed to self-care or diabetic management like diet, regularly doing exercises, foot care and periodic blood glucose monitoring. So, the patient should be empowered in self-care behaviors such as diet and physical activity and health care professional should participate in empowerment.

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LIST OF SYMBOLS AND ABBREVIATIONS

HL	-	Health Literacy
PI	-	prescription instructions.
HbA1c	-	Hemoglobin A1.
HLS	-	Health literacy scale.
SNS	-	subjective numeracy scale.
T2DM	-	Type 2 Diabetes Meletus.
KHLS-DM	-	Korean Health Literacy Scale for Diabetes Mellitus.
BMI	-	Body mass index.
CVD	-	Cardiovascular diseases.
REACH	-	Rapid Education/Encouragement and Communications for Health.
DSE	-	Diabetes self-efficacy.
DSMB	-	diabetes self-management behavior.
DSK	-	diabetes self-management knowledge.
DHB	-	diabetes health beliefs.
DHL	-	distributed health literacy.
DSME/S	-	diabetes self-management education and support.

LIST OF APPENDICES

- a. Ethical committee clearance
- b. Patient information sheet
- c. Informed consent
- d. Tool in English. *
- e. Tool in Hindi*.
 - As per agreement policy Tool should not be disclosed in public

ASSESSMENT OF HEALTH LITERACY AMONG ADULTS WITH TYPE II DIABETES RESIDING AT JAIPUR, RAJASTHAN

1.1 Background of the study

Diabetes word first coined by Greek physician Aretaeus (30-90CE). Diabetes mellites is a disease caused a deficiency in the production of insulin by the pancreas There are 2 types of Diabetes type I and II. Type - 2 diabetes mellitus (T2DM) formerly known as non – insulin dependent, which results from the body's inability to respond properly to the action of insulin produced by the pancreas. T2DM is most frequently occurring in adults and accounts for around 90% of all diabetes cases worldwide.

The epidemic of diabetes and its related complications were posed a global health threat. The International Diabetes Federation (IDF) estimated that 1 in 11 adults aged 20–79 years had diabetes mellitus globally in 2015.¹ This was estimated to increase 642 million by 2040, and main increase in low- income countries¹. This transition was truer in countries undergoing epidemiological changes.².

90 % of diabetes mellites were T2DM. Over 90% of diabetes mellitus cases are T2DM^{3,4}. The Diabetes mellites refers to both types unless it is distinguished⁵. The main causes of global diabetic epidemic mainly by a sedentary lifestyle, junk foods and population ageing.⁶ Most of the T2DM cases mainly prevented by maintaining optimal weight, healthy diet, and 30 minutes of exercise^{7,8}.

As per the NFHS report, 2015-16 found 5.8 % women and 8.8 per cent men in the age group of 15-59 years suffering from diabetes.⁹ Diabetes increases the global mortality. It is one of the leading causes of death and 90 to 95 % of cases can be managed by appropriate changes in lifestyle.¹⁰ T2DM patients need assistance for understanding and managing their diseases but optimum management is difficult for individuals and also to healthcare providers.¹¹

Physicians were not having adequate time and resources to explain the patient which promote adherence to treatment, changing their lifestyle, beliefs, attitudes.¹² Diabetes self-management education is important for the appropriate care of diabetes through empowering the patients to adopt an optimum strategy for their betterment of health.^{13,14}

A study in south India by **Hussain. R (2016)** reported that adequate knowledge and positive attitude are essential and adequate literacy has a significant association of Knowledge, attitude and practice in the general population, but women had significantly better knowledge.¹⁵

In India many of the persons don't have adequate knowledge, a cross-sectional study by **Babu MS (2015)** postulated (62.5%) diabetic patients were not aware of diagnostic criteria, and 73.4%, 28% were not aware of symptoms of diabetes and hypoglycemia. Even patients with diabetes for more than 10 years, (87.7%) diabetic patients did not know that fruits can be eaten by diabetics¹⁶.

Patients with type 2 diabetes mellitus (T2DM) face a higher risk of diabetic foot neuropathy, which increases the risk of death.¹⁷ The early detection, of factors that influence diabetic neuropathy reduces the risk of foot lesions, including foot ulcerations, lower extremity amputation, and mortality.¹⁷

Shiyanbola. OO (2017) identified that inadequate health literacy (HL) may lead to poor management of health and inappropriate use of health care especially in chronic diseases, and further recommended that health literacy level must be investigated in patients with diabetes.¹⁸

E.M Bergner (2017) recommended that technology-delivered interventions have the ability to improve self-management of diabetes and glycemic control among T2DM patients, but there is a evidence of changes in health literacy level ¹⁹.

Another study by **AD Shrestha (2013)** highlighted that women had low self-efficacy in diabetic care compared to men and gender difference was significantly associated to diabetic care, but considering an age, education, occupation and self-efficacy, men were having poor diet practices ²⁰.

Attitudes and beliefs about play a major role in effective management of Diabetes, A study in 2010 by **AR Sircar** substantiated that there was a major myth like tubal ligation and obesity, diet, exercises, insulin therapy, prohibition of sweet fruits, bitter taste vegetables are beneficial.²¹

1.2 Justification/Rationale for the study

Health literacy (HL) is a measurement of a patient ability to read, understand and take appropriate decisions based on medical instructions provided. Good HL patients have better health outcome compared to poorer HL. Understanding the relationship between patient factors, medication adherence, and lower glycated hemoglobin (HbA1c) will help patients in the better management of their own health²².

Lower HL is associated with several cardiovascular diseases (CVD) risk factors such as diabetes, hypertension, and metabolic syndrome (MS). Poor health literacy

may lead to poor health outcome, thus It is important to know how well T2DM understand and use health information available in relation to health-promoting behaviours.

There is a dearth of literature on health literacy especially in diabetes patients in Rajasthan, where already poor status of healthcare facilities in terms of the practice of evidence-informed health care. It becomes more important to have adequate health literacy among the population and patients especially. Hence, the study is intended to assess health literacy among T2DM adults residing at Jaipur.

1.3 Statement of the problem

A study to assess the Health literacy among Type 2 Diabetes Meletus (T2DM) adults residing in Jaipur, Rajasthan. India.

1.4 Objectives

1. To assess the level of health literacy among adults with T2DM attending secondary/ tertiary health care facilities at Jaipur, Rajasthan
2. To identify the association of level of health literacy with demographic characteristics among adults with T2DM

1.5 Null Hypothesis

H₀₁: There is no Health literacy among T2DM adults.

H₀₂: There is no association between Health literacy and demographic characteristics of T2DM adults.

1.6 Assumptions

1. The T2DM adults may have low health literacy level.
2. Health literacy is essential for self-care behaviour and patient empowerment is needed.

3. Level of health literacy depends upon understanding of information which depicts in clinical outcome,

1.7 Delimitations

The study was limited to T2DM adults residing at Jaipur district only and may be dominated by urban population.

2. REVIEW OF LITERATURE

Taksande BA (2017) illustrated in his study that around 82.9% of the patients were aware of the disease and 23.2% were aware of the complications of the DM. In 63% of the patients, foot care examination and education regarding foot complications were not suggested by their treating physicians.²⁴

A cross-sectional study by **Srinivasan N.K (2017)** explored that adequate knowledge was significantly associated with a positive attitude towards diabetes, awareness of its complications and ability to follow good practices related to health²⁵.

Vlaar EMA (2017) suggested that at the follow up of 2 years after study that the intervention group has improved from their baseline level and changes in diet and physical activity too.²⁶.

Babu M.S (2015) postulated that diabetic patients did not know that fruits can be eaten by diabetics and 90.8% of people have not attended any formal diabetic education class.²⁷.

The qualitative study by **Patel V (2016)** identified the following themes such as causal beliefs of diabetes, use of alternative therapies, moderation of food, adaption of exercise regimes and sources of information and concluded that all were aware of avoiding certain foods but still consuming these foods²⁸.

The cross-sectional study by **Balasubramanian (2016)** reported about 35.9% people are not aware of eye effects but others 33.3% reported that persistent high blood sugar level, 17.9 % told longer duration and lifestyle was 12.8 % reported reasons for eye effects in DM²⁹.

Singh s et.al (2018) done a cross-sectional survey explored that, diabetic patients those are having low HL are having difficulty in understanding of PI and recommended that appropriate strategy has to be adapted to follow the instructions of medications properly by patients.³⁰

Huang Y.M (2018) investigated cross-sectionally and supported that persons with high analytical skills are having greater medication self-efficacy which enhances diabetes medication adherence, and lower level of HbA1c.³¹

shin K.S (2018) examined and findings reflected that enrolling for diabetes education, there is an indirect effects of health literacy to self-care behaviours through empowerment and the self-care behaviours were particularly diet and physical exercise.³².

The **Nelson LA (2018)** investigated and highlighted that younger age and lower health literacy were associated with higher barrier scores for all IMB model constructs. and also suggested that identification of patient specific barriers to diabetic medication adherence. This identification may improve HbA1c³³.

chen P.Y (2018) systemic reviewed and concluded that the contribution of low health literacy to diabetic foot disease requires definitive assessment through longitudinal studies³⁴.

Again, another study by **chen TY etal (2018)** results of multiple logistic regression showed that glycated hemoglobin and communication and critical health literacy ($B = -0.082$, $p = .034$) were significant factors of diabetic foot neuropathy. The findings of this study suggested that nurses should assess the health literacy of patients with T2DM before providing health education and should develop a specific foot-care intervention for individuals with poor glycemic control³⁵.

Huang Y.M (2018) study revealed that Lower diabetes medication adherence and higher number of prescribed medications were correlated with a higher HbA1c further proven that Health literacy, does not correlate with medication adherence or glycaemic control among patients with type 2 diabetes. ³⁶.

A cross-sectional survey by **Kim.Ka et.al (2018)** found health promotion behaviors were positively correlated with electronic health literacy perceived benefits and self-efficacy. The strategies have to be formulated to improve health promotion behaviours in T2DM patients and focus on analyzing health literacy level. ³⁷.

Hussein SH et.al (2018) recommended that Interventions should be implemented to improve health literacy which will reduce complications, and improve better diabetes outcomes, and quality of life too. ^{38,39}

Seib et.al (2018) examined and not recommended any type of intervention but dictated that future research should consider interventions that target multiple health behaviours and emphasize health literacy, self-efficacy, and problem-solving skills ⁴⁰

Niknami (2018) described that persons with higher HL found managing T2DM were better and facing fewer challenges and their clinical outcomes were within normal range further implied that interventions targeting to improve patients health literacy can be the best tool to address the burden of T2DM ⁴¹

Liu XN (2018) advocated that, Patients in intervention groups were more likely to achieve a goal HbA1c level (HbA1c <7.0%) than those in control group, with the highest glycaemic control rate (25.3%) observed in the comprehensive intervention group at 3(rd) month and then in exercise intervention group (25.3% and 34.6%) respectively, at 6(th) month and 12(th) month. The average levels of HbA1c in three intervention groups were

lower at each follow-up time point than those at baseline survey. However, the decreases in HbA1c were obvious only at 6(th) month, with ls-mean respectively, in comprehensive, health literacy and exercise intervention groups, but it increased slightly by 0.03% in control group. Compared with control group, the interventions were significantly associated with the decrease of HbA1c level, with the most improvement observed in comprehensive group at 3rd month, and in exercise intervention group at 6th month and at 12(th)month of follow-up. Stratified analyses showed that patients with lower health literacy level could benefit from any intervention, while those with higher numeracy skill benefited more from exercise intervention. This study advocated further Both health literacy and exercise-focused interventions may decrease HbA1c level in patients with T2DM, which would be helpful in reducing the risks of complications and deaths in diabetes patients ⁴².

The focus group study by **Pardhan s. et.al (2018)** discovered that Barriers were demographic-specific. This study concluded that barriers were present to improve awareness about diabetes and in different demographic profile. Lack of culturally appropriate diabetes education programs in the community was a major barrier in older and illiterate participants, but similarly in younger participants were time constraints. ⁴³.

The study findings, by **Gharachourlo et.al (2018)** showed that there is no significant difference before intervention but there is an improvement in scores of lifestyle and health literacy between the two groups immediately and three weeks after the intervention. ⁴⁴.

T Shawley-Brzoska S. et. Al (2018) study conveyed that majority of participants perceived more benefits and fewer barriers to program participation. Perceived benefits were interaction with health a coach or instructor, improved lifestyle modifications. And

satisfaction with the program (75%) further recommended that feedback can be used as a guide for future interventions⁴⁵.

Saeed H et al (2018) study emphasized that the inadequate HL is associated with poor blood sugar control and diabetic complications especially in retinopathy thus educational and training program should be formulated to improve HL and for better blood glucose control.⁴⁶.

Chahardah – Cherek S MS (2018) concluded that HL has positively related to health promotion behaviors in T2DM patients and further recommended that health care providers have to concentrate to improve HL not only on knowledge and also the development of health-promoting behaviors in patients⁴⁷.

Radwan M et.al (2018) concluded that glycemic control was suboptimal, and factors associated with that were: older age, high medication adherence, and better health literacy. Knowledge of above-mentioned factors has to be considered in targeting interventions to improve blood glucose level control and prevent diabetes-related complications⁴⁸.

Olesen et.al (2017) explored that the urgency to responding to HL level of DM patients and there is a need to provide a program to enhance health literacy to reduce complications among diabetic patients⁴⁹.

Quartuccio M (2017) done cross-sectional survey concluded that lower HL related to greater likelihood of diabetes and fasting blood glucose levels in women but in men, there is a difference in demographic and lifestyle factors⁵⁰.

Schinckus L(2018), revealed that distress or depression do not predict self-care behaviors directly, but moderate the effect of health literacy, which has a weaker impact on patients experiencing distress or depression. But contradictory distress and depression do not have an effect of self-efficacy on diabetes self-care behaviors.⁵¹

Reyes J et. al (2017) explored that issues regarding diabetes self-management between persons in good versus poor glycaemic control qualitatively and recommended that health care providers and intervention personnel should consider about how to do self-management tasks and guide patients to adopt their own diabetes regimen.⁵²

A cross-sectional study by **Ariza Bolivar (2017)** estimated that inadequate HL was significantly associated with poor blood glucose level and suggested that efforts should focus on developing interventions to improve blood glucose control among T2DM patients with inadequate HL⁵³.

A cross-sectional study by **Zuercher et al (2017)** illustrated that among 381 patients 52.5% 40.7% and 6.8% reported high, medium and low FHL, and significant associations were found for; lower self-efficacy scores and SF-12 mental scores associated with poor FHL⁵⁴.

Muller et al (2017) done an international study to develop a Web-based intervention promoting physical activity among people with type 2 diabetes and explored that participants in the interactive intervention group had acquired more diabetes knowledge and both groups participants had a high level of satisfaction and they were recommended the website to others⁵⁵.

McCurley (2017) synthesized and commented that culturally based lifestyle interventions for diabetes mellitus has modest effect in reducing the risk for diabetes and its complications in Hispanics in the U. S⁵⁶.

3. Methodology

3.1 Study design

The Research design adopted for this study is cross sectional study to estimate health literacy among adults with T2DM at Jaipur, Rajasthan,

3.2 Variables of the study

3.2.1 Independent Variables

age, sex, education, marital status, habits, Years of Hyperglycemia, family history of hyperglycemia, co morbid illness.

3.2.c dependent variables

Health literacy

3.3. Study setting

Sawai Man Singh Hospital, which is a largest tertiary care Govt super specialty hospital having 43 departments Catering nearly 5000 patients daily for OPD services. This study was conducted in Internal Medicine Department at SMS Hospital to adults coming for a treatment.

3.4 Population

Population is the entire aggregation of client's similar characteristics and on whom researcher would generalize the study findings. The population include both target and accessible population.

3.4.1 Target population

The target population of the study is all adults with T2DM.

3.4.2 Accessible population

Accessible population was adults residing in Jaipur attending Internal Medicine Department of SMS hospital. Jaipur, Rajasthan.

3.5. Sample & Sample size

A sample is the basic element of the population about whom the information is collected to represent the concept of interest. The samples of the study were Adults with diabetes full filled the inclusion criteria. In Rajasthan prevalence rate for Diabetes is 6%. So, the study population is 219,235.62. Sample size comprises of total 100 T2DM Adults

3.6 Sample selection criteria.

3.6.1 The eligibility criteria for this study was

1. Adults aged <60 years diagnosed to have Diabetes type II for at least 1 year
2. Adults who were resident of Jaipur district since 2010.
3. Adults who were able to read, understand and respond in Hindi.
4. Adults willing to participate in this study and provide consent

3.6.2 Exclusion criteria: This study excluded

1. Adults suffering from any chronic physical illness, like renal failure, congenital heart diseases.
2. Adults with mental illness
3. Terminally ill adults.

3.7 Sampling Technique.

Samples were selected conveniently based upon availability and location of the geographical area, Jaipur.

3.8 Data collection instrument

The tool used for the study was self-reported questionnaire has the following components.

3.8.1 part 1

Part 1.a consists of 5 items about demographic profile of age, sex, marital status, educational status, Habits.

Part. 1.b consists of 3 items about clinical profile of years of hyper glycemia, family history of hyper glycaemia, co morbid illness.

3.8.2-part 2

Part 2 This study used self-reported standard Health literacy scale developed by Monash & Daikin University, Australia after obtained permission to use in this study. Health literacy scale contains 44 items measured following 9 domains like HPS, HIS, AMH, SS, CA, AE, NHS, FHI,UHI

3.9 validity & reliability

To ensure the content validity of part -I of tool blueprint and criteria check list were submitted to 5 experts in the field of community medicine. Based on their suggestions and opinions the tools were modified.

II part of tool was standard Health Literacy questionnaire which was developed by Deakin & Monash University licensure version . thus, the reliability of standard health literacy tool was proven to be 95%

3.10 Data collection procedure

The data were collected after obtaining formal permission from appropriate authorities to collect information among Adults with Type II Diabetes. Brief introduction about self and study objectives were provided and informed written consent are obtained. Participants were selected from OPD by convenience sampling technique. After collecting demographic data, the health literacy Questionnaire was distributed to T2DM adults the respondents were requested to mark X against the appropriate answer in the space provided.

3.11 Analysis plan and expected outcome

1. Descriptive statistics was used to asses baseline Demographic data
2. Inferential statistics was used to analyze association of health literacy with demographic characteristics among Adults with Type II Diabetes

3.12 Ethical considerations

The protocol was submitted for ethical clearance IRB of SMS Hospital and IIHMR university, Jaipur. The investigator considered following ethical principles preceding data collection.

Human Rights

1. Ethical committee approval received from the IRB
2. To execute the study a written consent from the Head of the Institution was obtained to conduct the study at IIHMR University, Jaipur.

3. Content validity was received from the various experts in the field of community medicine, public health professionals.

Beneficence and Non-Maleficence

4. The investigator is qualified in public health to execute the study

5. Potential benefits and risk was explained to the clients with Diabetes.

Dignity

6. Informed consent was obtained from the samples related to the study purpose, type of data, nature of commitments, participations.

7. 'rights to withdraw / withhold the information was ensured before data collection.

8. Investigator's contact information was disseminated to all adults with Type II Diabetes.

Confidentiality

10. Confidentiality and Anonymity Pledge was ensured.

11. Confidentiality of their responses was maintained

Justice

12. Health literacy data will be collected from adults with Type II Diabetes

4. RESULTS AND ANALYSIS

The analysis is described as “categorizing, ordering, manipulating and summarizing the data to obtain an answer to the research question”. In this study descriptive statistics used to examine the quantum of information and inferential statistics used to determine the relationship and causality. This chapter deals with analysis and interpretation of data collected from the adults with T2DM on Health Literacy. The data were entered Excel sheet and analysed through the Statistical Package for Social Science / PC+ Ver.17.

The data was analyzed, and results were displayed in following sections.

Section 4.1.a: Description of Demographic profile of the Adults with T2DM

Table 4.1.a. Demographic profile of adults with T2DM

Section 4.1.b: Clinical profile of the adults with T2DM

Table 4.1.b. frequency and percentage distribution of clinical variables.

Section 4.2: Levels of Health literacy of the Adults with T2DM

Section 4.3: Association of Health literacy with demographic variables of Adults with T2DM

Table 4.3. a Association of feeling understood and supported by Health care providers (HPS)

Table 4.3.b Association of having enough information to manage Health (HIS).

Table 4.3.c Association of actively managing Health (AMH).

Table 4.3.d Association of social support for Health (SS).

Table 4.3.e Association of appraisal of Health Information (CA).

Table 4.3.f Association of ability to actively engage with health care providers (AE).

Table 4.3.g Association of navigating the Health care system (NHS).

Table 4.3.h Association of ability to find good health information (FHI).

Table 4.3.i Association of Understand health information well enough to know to do. (UHI)

Table 4.1.a: Demographic Profile of Adults with T2DM attending SMS Hospital, Jaipur

n=100

S. N	Demographic Characteristics	F	%
1	Age in Years		
	40-50 Yrs.	36	36%
	51-60 Yrs.	19	19%
	> 60 Yrs.	45	45%
2	Sex		
	Male	58	58%
	Female	42	42%
3	Marital Status		
	Married	84	84%
	Unmarried	5	5%
	Others	11	11%
4	Education		
	Primary	35	35%
	High school	50	50%
	Graduate and above	15	15%
5	Habits		
	Smoking	12	12%
	Alcohol	3	3
	Oral Tobacco products	21	21
	None	64	64

The above table 4.1.a depicts Frequency and Percentage Distribution of adults with T2DM. regarding age majority 45 (45%) of adults were above 60, about marital status majority (84%) were currently married and half of percentage of adults completed high school education. 21 % of adults were consuming oral tobacco products whereas only few 3%consuming alcohols.

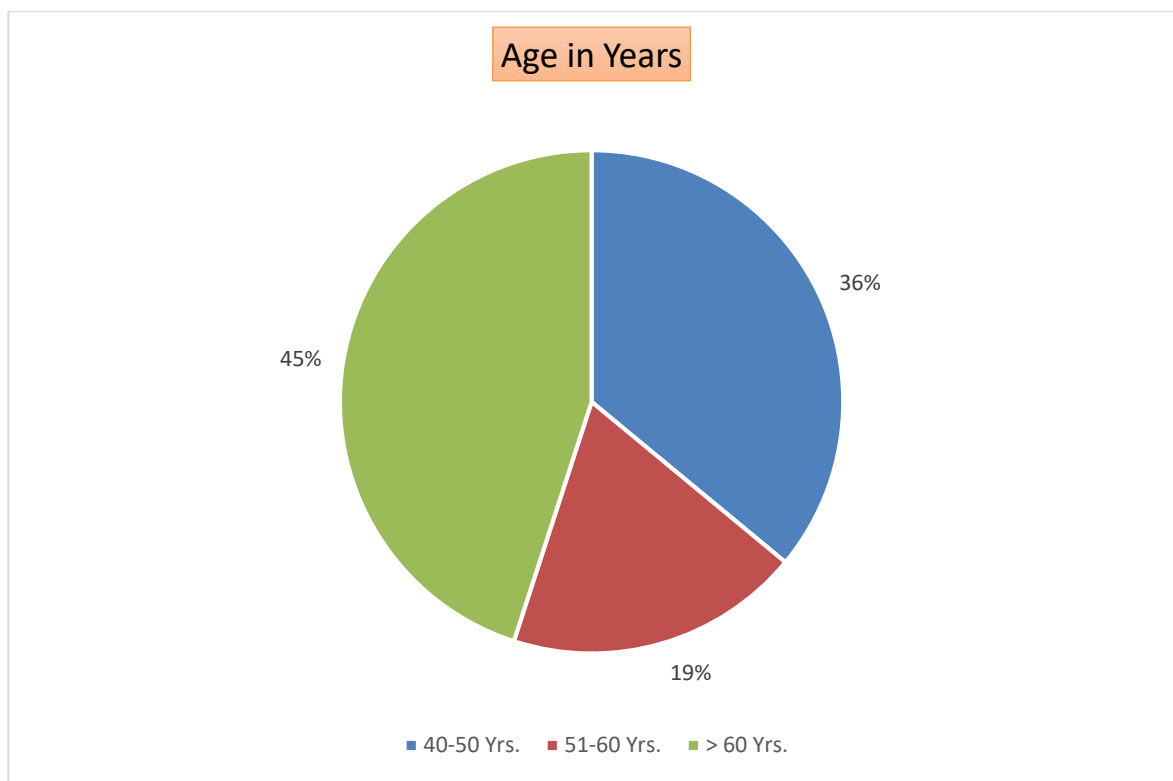


Figure 4.1. Distribution of study participants by Age

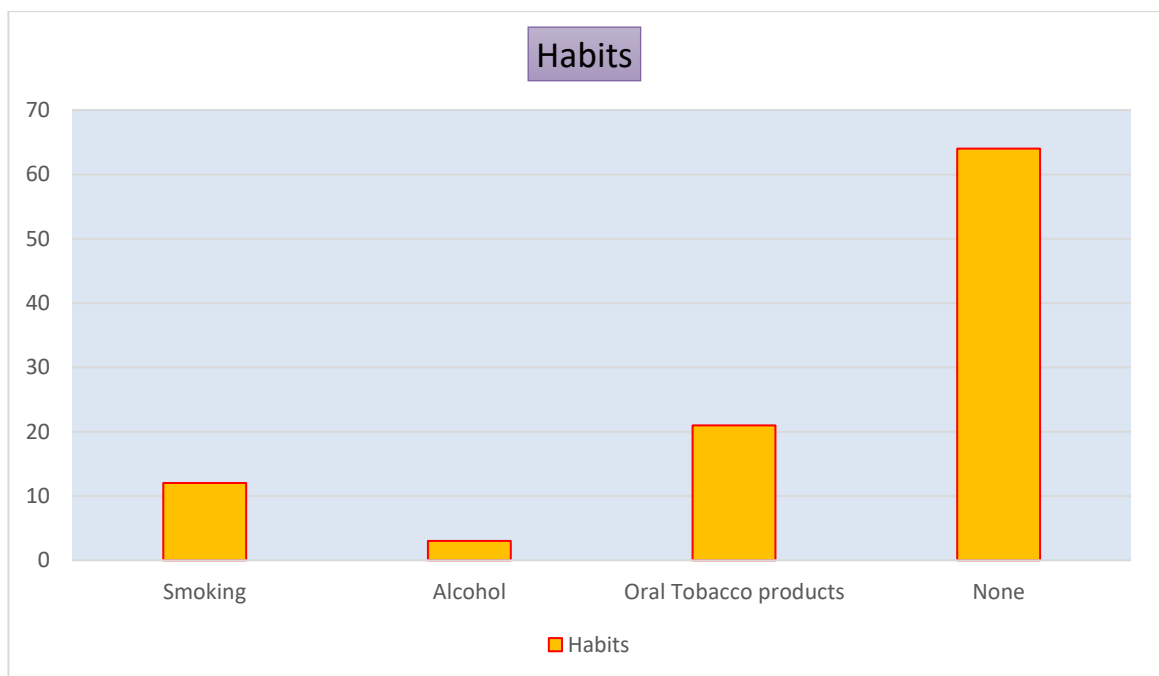


Figure 4.2. Distribution of study participants, by Habits

Table 4.1b: Clinical profile of Adults with T2DM**n=100**

S. N	Clinical Profile	F	%
1	Years of Hyperglycemia		
	1-5 Yrs.	73	73%
	6-10 Yrs.	11	11%
	11-15 Yrs.	4	4%
	16-20 Yrs.	12	12%
2	Family History		
	Mother	7	7%
	Father	12	12%
	Both	5	5%
	Not Known	76	76%
3	Co morbid Illness		
	Respiratory disease	13	13%
	Kidney Disease	2	2%
	Cardiac Diseases	31	31%
	Neurological Disease	13	13%

The above table 4.1.b depicts Frequency and Percentage Distribution of clinical profile of adults with T2DM. majority of adults (73) has hyperglycemia in the last 5 years and very few 5% adults both parents had T2DM. whereas majority of adults 31% were .suffering with cardiac problems also.

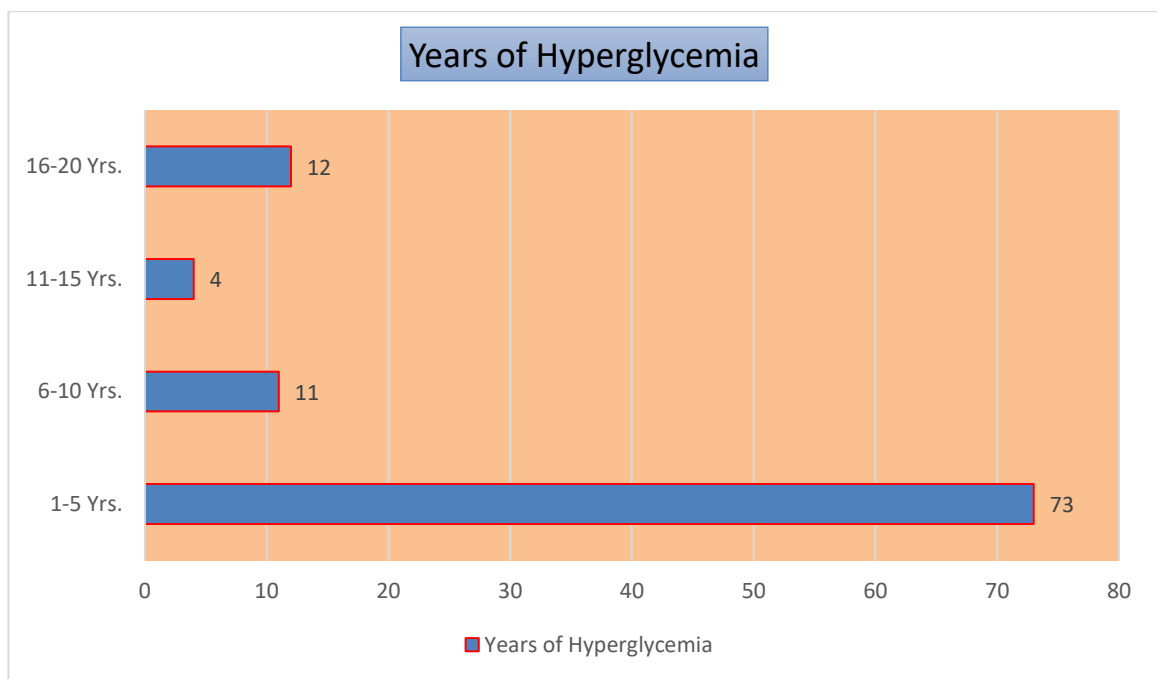


Figure 4.3. Distribution of study participants, by years of hyperglycaemia

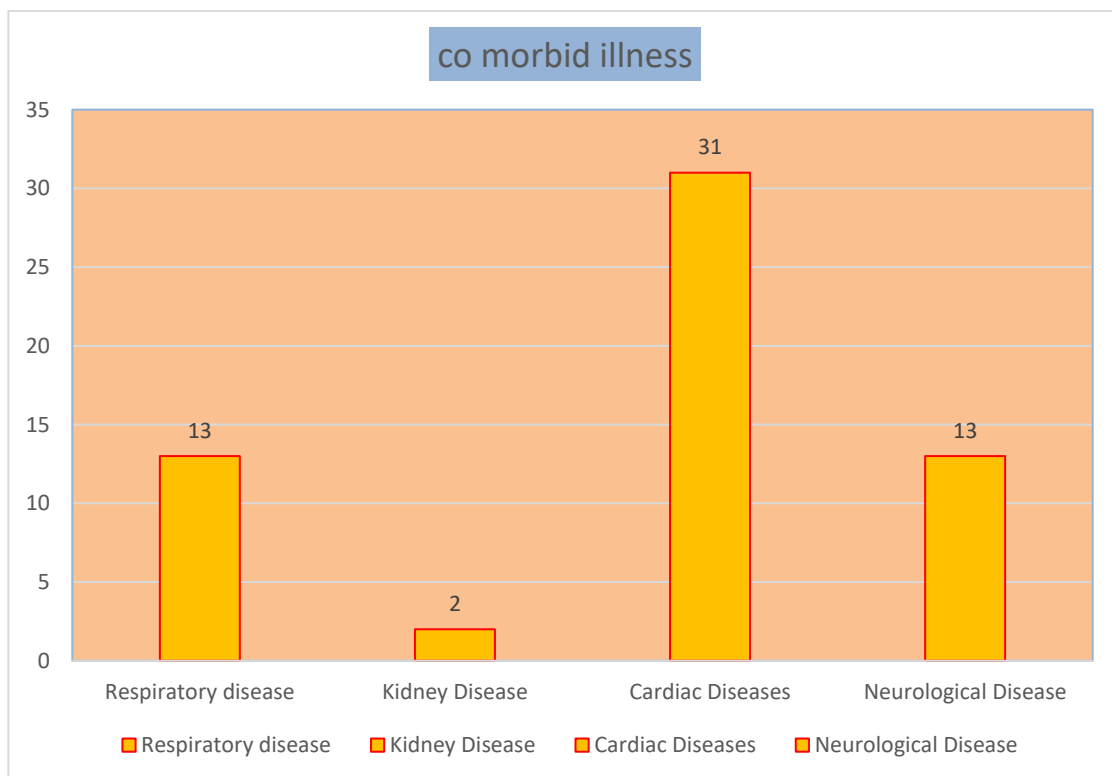


Figure 4.4. Distribution of study participants, by co-morbid illness

Table 4.2: Levels of Health Literacy in Adults with T2DM**n=100**

S.No	Domains of Health Literacy	Adequate (F)	%	Inadequate (F)	%
1	Feeling understood and supported by Health care providers (HPS)	42	42	58	58
2	Having enough information to manage my Health (HIS)	54	54	46	46
3	Actively managing my Health (AMH)	52	52	48	48
4	Social support for Health (SS)	66	66	44	44
5	Appraisal of Health Information (CA)	49	49	51	51
6	Ability to actively engage with health care providers (AE)	55	55	45	45
7	Navigating the Health care system (NHS)	76	76	24	24
8	Ability to find good health information (FHI)	31	31	69	69
9	Understand health information well enough to know what to do (UHI)	78	78	22	22

Table 4.2: shows levels of Health Literacy in Adults with a T2DM majority 58% of adults felt low support by health care providers, 50% of them have enough information and actively managing their health. Majority of adults 66% have good social support, half of the adults has felt health information in diabetic management was low and engaging low with health care workers and they were not able to get good health information.

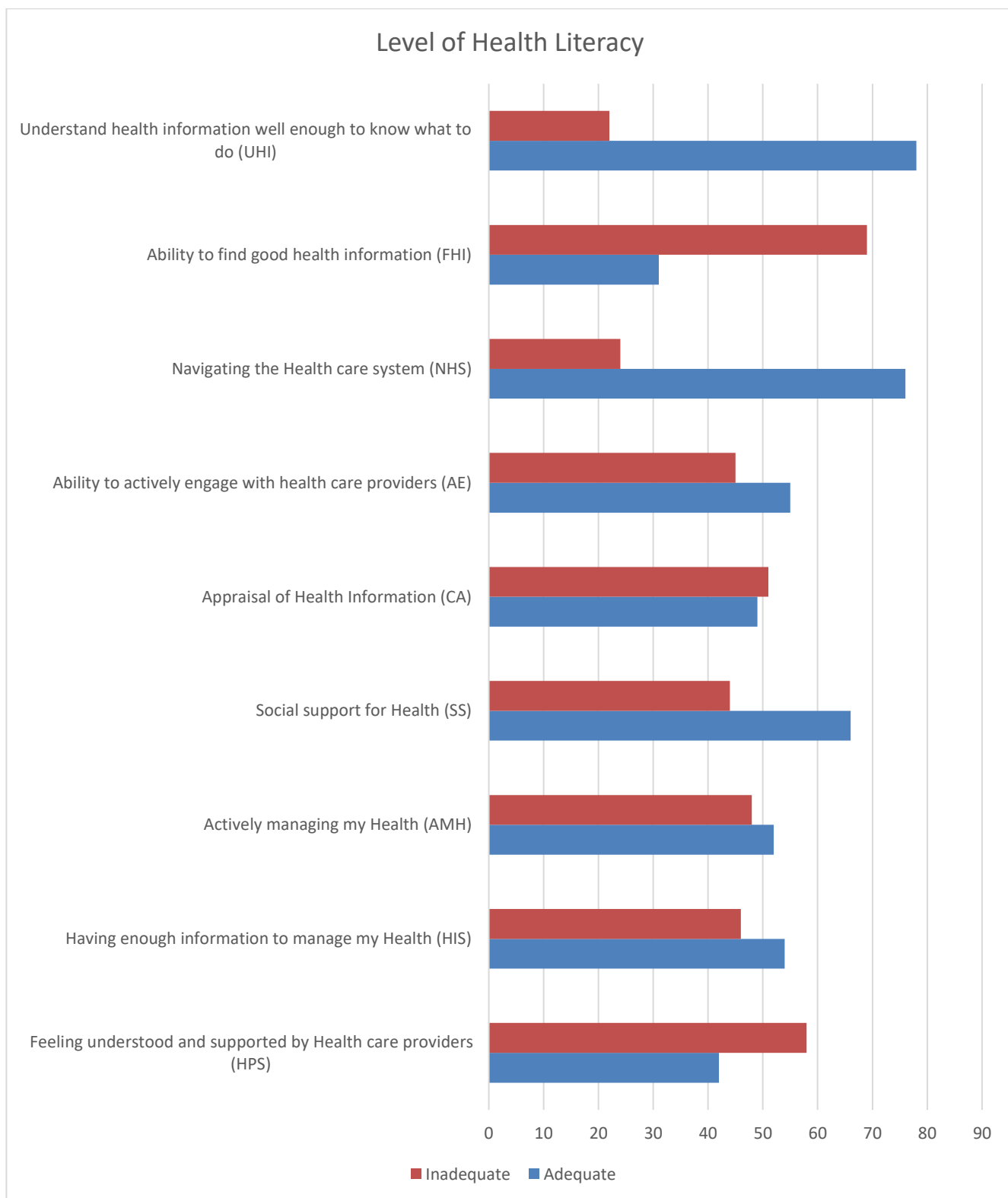


Figure 4.5 Level of Health literacy among study participants.

Section 4.3: Association of Health literacy with demographic variables

Feeling understood and supported by HCPs

Table 4.3a. Association of feeling understood and supported by HCPs with demographic characteristics (n=100)				
Demographic Profile		Adequate	Inadequate	χ^2
Age	40-50 Yrs	17	19	$\chi^2 = 1.25$ p - 0.535
	51-60 Yrs	6	13	
	> 60 Yrs	19	26	
Sex	Male	28	30	$\chi^2 = 2.23$ p - 0.135
	Female	14	28	
Marital Status	Married	35	49	$\chi^2 = 0.812$ p -0.666
	Unmarried	3	2	
	Others	4	7	
Education	Primary	14	13	$\chi^2 = 2.53$ p -0.281
	High school	24	34	
	Graduate and above	4	11	
Habits	Habits			$\chi^2 = 14.29$ p -0.002 *
	Smoking	2	10	
	Alcohol	1	2	
	Oral Tobacco products	16	5	
	None	23	41	

*Significant at p<0.05 level

Table 4.3.a shows the Association of Scale-1 Feeling understood and supported by Health care providers (HPS) with demographic characteristics. Results from the above table revealed that habits in adults $\chi^2 = 14.29$ with p value -0.0025 has significantly associated with understanding and support by health care workers.

Having enough information to manage their Health (HIS)

Table 4.3.b Association of Scale-2 Having enough information to manage their Health (HIS) with demographic characteristics n=100				
Demographic Profile		Adequate	Inadequate	χ^2
Age	40-50 Yrs	18	18	$\chi^2 = 4.45$ p - 0.107
	51-60 Yrs	7	12	
	> 60 Yrs	29	16	
Sex	Male	32	26	$\chi^2 = 0.076$ p -0.782
	Female	22	20	
Marital Status	Married	42	42	$\chi^2 = 0$
	Unmarried	5	0	
	others	7	4	
Education	Primary	19	16	$\chi^2 = 0.299$ p -0.861
	High school	26	24	
	Graduate and above	9	6	
Habits	Smoking	8	4	$\chi^2 = 5.166$ p -0.159
	Alcohol	1	2	
	Oral Tobacco products	15	6	
	None	30	34	

*Significant at p<0.05 level

Table 4.3.b shows the association of Scale-2 Having enough information to manage my Health (HIS) with demographic characteristics. Results from the above table revealed none of the variables has significantly associated with having enough information to manage their health.

Actively managing Health (AMH)

Table 4.3.c Association of actively managing Health (AMH) with demographic characteristics. n=100				
Demographic Profile		Adequate	Inadequate	χ^2
Age	40-50 Yrs	21	15	$\chi^2 = 1.094$ p -0.578
	51-60 Yrs	10	9	
	> 60 Yrs	21	24	
Sex	Male	34	24	$\chi^2 = 2,425$ p -0.119
	Female	18	24	
Marital Status	Married	45	39	$\chi^2 = 0$
	Unmarried	5	0	
	others	2	9	
Education	Primary	14	21	$\chi^2 = 11.00$ p -0.004*
	High school	34	16	
	Graduate and above	4	11	
Habits	Smoking	6	6	$\chi^2 = 2.57$ p -0.462
	Alcohol	1	2	
	Oral Tobacco products	14	7	
	None	31	33	

* Significant at p<0.05 level

Table 4.3.c shows the association of Scale-3 Actively managing Health (AMH) with demographic characteristics. Results from the above table revealed that education level in adults $\chi^2 = 11$ with p value -0.004 has significantly associated to actively managing their health and rest of the characteristics not significantly associated with demographic characteristics.

Social support for Health (SS)

Table 4.3.d Association of Scale-4 Social support for Health (SS) with demographic characteristics n=100				
Demographic Profile		Adequate	Inadequate	χ^2
Age	40-50 Yrs	18	18	$\chi^2 = 6.60$ p -0.367*
	51-60 Yrs	15	4	
	> 60 Yrs	33	12	
Sex	Male	36	22	$\chi^2 = 0.951$ p -0.329
	Female	30	12	
Marital Status	Married	54	30	$\chi^2 = 0$
	Unmarried	5	0	
	others	7	4	
Education	Primary	27	8	$\chi^2 = 2.97$ p -0.225
	High school	30	20	
	Graduate and above	9	6	
Habits	Smoking	6	6	$\chi^2 = 6.841$ p -0.771
	Alcohol	1	2	
	Oral Tobacco products	11	10	
	None	48	16	

* Significant at p<0.05 level

Table 4.3.d shows the association of social support for health (SS) with demographic characteristics. Results from the above table revealed that the age of adults $\chi^2 = 6.60$ with p value -0.367 has significantly associated to get social support and none were significantly associated with demographic characteristics.

Appraisal of Health Information (CA)

Table 4.3.e Association of appraisal of Health Information (CA) with demographic characteristics.				
n=100				
Demographic Profile		Adequate	Inadequate	χ^2
Age	Age in Years			$\chi^2 = 1.078$ P -0.583
	40-50 Yrs	20	16	
	51-60 Yrs	8	11	
	> 60 Yrs	21	24	
Sex	Sex			$\chi^2 = 0.410$ P -0.521
	Male	30	28	
	Female	19	23	
Marital Status	Marital Status			$\chi^2 = 0$
	Married	39	45	
	Unmarried	5	0	
	others	5	6	
Education	Education			$\chi^2 = 3.978$ P -0.1369
	Primary	17	18	
	High school	28	22	
	Graduate and above	4	11	
Habits	Habits			$\chi^2 = 0$
	Smoking	4	8	
	Alcohol	0	3	
	Oral Tobacco products	15	6	
	None	30	34	

* Significant at p<0.05 level

Table 4.3.e shows the association of Appraisal of Health Information (CA) with demographic characteristics. Results from the above table revealed that appraisal of Health Information has not significantly associated with none of the demographic characteristics.

Ability to actively engage with health care providers (AE)

Table 4.3.f Association of ability to actively engage with health care providers (AE) with demographic characteristics n=100				
S.No	Demographic Profile	Adequate	Inadequate	χ^2
Age	40-50 Yrs	21	15	$\chi^2 = 8.099$ p -0.0174*
	51-60 Yrs	5	14	
	> 60 Yrs	29	16	
Sex	Male	37	21	$\chi^2 = 4.314$ p -0.0377*
	Female	18	24	
Marital Status	Married	44	40	$\chi^2 = 0$
	Unmarried	5	0	
	others	6	5	
Education	Primary	16	19	$\chi^2 = 3.276$ p -0.194
	High school	32	18	
	Graduate and above	7	8	
Habits	Smoking	10	2	$\chi^2 = 7.323$ p -0.0622
	Alcohol	1	2	
	Oral Tobacco products	14	7	
	None	30	34	

* Significant at p<0.05 level

Table 4.3.f shows the association of ability to actively engage with health care providers with demographic characteristics. Results from the above table revealed that education level $\chi^2 = 11$ with p value -0.004 and sex differences $\chi^2 = 4.314$ with p -0.0377 in adults to actively engage with health care providers has significantly associated and rest of the variables not significantly associated with demographic characteristics.

Navigating the Health care system (NHS) with demographic characteristics

Table 4.3.g Association of Scale-7 navigating the Health care system (NHS) with demographic characteristics n=100				
Demographic Profile		Adequate	Inadequate	χ^2
Age	40-50 Yrs	28	8	$\chi^2 = 11.40$ p -0.003*
	51-60 Yrs	9	10	
	> 60 Yrs	39	6	
Sex	Male	47	11	$\chi^2 = 1.918$ p -0.165
	Female	29	13	
Marital Status	Married	64	20	$\chi^2 = 9076$ p -0.635
	Unmarried	3	2	
	others	9	2	
Education	Primary	28	7	$\chi^2 = 0.475$ p -0.778
	High school	37	13	
	Graduate and above	11	4	
Habits	Smoking	10	2	$\chi^2 = 0$
	Alcohol	3	0	
	Oral Tobacco products	19	2	
	None	44	20	

* Significant at p<0.05 level

Table 4.3.g shows the association of navigating the Health care system with demographic characteristics. Results from the above table revealed that age of adults $\chi^2 = 11.40$ with p value -0.003 to navigating the health care system has significantly associated and rest of the variables not significantly associated with demographic characteristics.

Ability to find good health information (FHI)

Table 4.3.h Association of Scale-8 ability to find good health information (FHI) with demographic characteristics n=100				
Demographic Profile		Adequate	Inadequate	χ^2
Age	40-50 Yrs	11	25	$\chi^2 = 3.024$ p -0.220
	51-60 Yrs	3	16	
	> 60 Yrs	17	28	
Sex	Male	26	32	$\chi^2 = 12.34$ p -0.0004
	Female	5	37	
Marital Status	Married	26	58	$\chi^2 = 2.810$ p -0.245
	Unmarried	3	2	
	others	2	9	
Education	Primary	8	27	$\chi^2 = 3.826$ P -0.147
	High school	20	30	
	Graduate and above	3	12	
Habits	Smoking	8	4	$\chi^2 = 14.34$ P -0.0024*
	Alcohol	1	2	
	Oral Tobacco products	10	11	
	None	12	52	

* Significant at p<0.05 level

Table 4.3.h shows the association of ability to find good health information with demographic characteristics. Results from the above table revealed that habits of adults $\chi^2 = 14.34$ with p value -0.0024 to ability to find good health information has significantly associated and rest of the variables not significantly associated with demographic characteristics.

Understand health information well enough to know what to do (UHI)

Table 4.3.I Association of understand health information well enough to know what to do (UHI) with demographic characteristics. n=100				
S.No	Demographic Profile	Adequate	Inadequate	χ^2
1	Age in Years			$\chi^2 = 8.973$ P -0.0112 *
	40-50 Yrs	31	5	
	51-60 Yrs	10	9	
	> 60 Yrs	37	8	
2	Sex			$\chi^2 = 3.382$ P -0.0659
	Male	49	9	
	Female	29	13	
3	Marital Status			$\chi^2 = 0$
	Married	67	17	
	Unmarried	5	0	
	others	6	5	
4	Education			$\chi^2 = 2.897$ P -0.234
	Primary	24	11	
	High school	42	8	
	Graduate and above	12	3	
5	Habits			$\chi^2 = 6.841$ P -0.771
	Smoking	10	2	
	Alcohol	1	2	
	Oral Tobacco products	20	1	
	None	47	17	

* Significant at p<0.05 level

Table 4.3.I shows the association to understand health information well enough to know what to do with demographic characteristics. Results from the above table revealed that age of the adults $\chi^2 = 8.973$ with p value -0.0112 has significantly associated and rest of the variables not significantly associated with demographic characteristics

5. DISCUSSION

A cross-sectional study was done to assess the health literacy among T2DM attending tertiary care hospital, Jaipur, Rajasthan. T2DM adults, based upon sampling criteria samples were recruited conveniently at Tertiary care Hospital. The need for the study was explained and obtained consent following that self-reported health literacy questionnaire was distributed to T2DM adults. Adults were asked to put a tick mark against respective answers. The primary objective of the study was to assess the health literacy among T2DM diabetes mellites, the findings from the study shown that majority 58% of T2DM adults felt low support by health care providers, only 50% of adults have enough information and actively managing their health. Majority of adults 66% have good social support. Half of the adults have felt health information in diabetic management was low and engaging low with health care workers and they were not able to get good health information.

The present study result was consistent with the findings of the following study carried out by:

Shin K.S has investigated the relationships between HL and diabetes self-care behaviours and study findings reflected that after diabetes education, the indirect effects of health literacy to self-care behaviours through empowerment were significant particularly in diet and physical exercise. Whereas, the indirect effects were not significant when the self-care behaviours were foot care and blood glucose monitoring.

The results from above findings revealed that there is a health literacy among adults with T2DM, thus Hypothesis stated as **H₀₁ - *There is no health literacy among adults with T2DM*** was not accepted.

The secondary objective of the study is to associate health literacy with demographic variables. The finding showed that (HPS) habits in adults have significantly associated with understanding and support by healthcare workers. An education level of T2DM adults has significantly associated to actively managing their health and their age has significantly associated to get social support. likewise, education level and sex differences in adults has significantly associated to actively engage with Healthcare workers. Age of adults has significantly associated to navigating health care system, similarly that habits of adults have significantly associated inability to find good health information and to understand health information well enough to know what to do by T2DM adults.

The present study result was supported by the findings of the following studies carried out by:

Kim.Ka et.al (2018) has done a cross-sectional survey and found that health-promoting behaviours were significantly correlated with electronic health literacy perceived benefits and self-efficacy. The same study further recommending that strategies to improve health-promoting behaviours in patients with type 2 diabetes should focus on analyzing levels of electronic health literacy and deepening their understanding of online information accordingly.

The results from above findings revealed that there is a significant association of Habits, Age, education level of T2DM adults with demographic characteristics thus Hypothesis stated as **H₀₂ - *There is no association of health literacy with demographic characteristics*** was not accepted.

6. CONCLUSION

Health literacy (HL) is a measurement of a patient ability to read, understand and to take decisions based upon medical instructions provided. Physicians typically do not have the time or resources to address these patient factors that may influence health outcomes for people with diabetes: adherence to treatment regimen, beliefs, attitudes, culture, understanding of the disease, language ability and health literacy, socioeconomic status, comorbidities, and social support.¹² HL is essential for prevention of diabetes and appropriate care through empowering patients to increase activity in their own health and care.¹³

The diabetic management is an art but blended with science. Though this study done in urban population but proved that health literacy is needed to self-care or diabetic management like diet, regularly doing exercises, foot care and periodic blood glucose monitoring. So, the patient should be empowered in self-care behaviors such as diet and physical activity and healthcare professional should participate in empowerment.

6.1 Implications

The following implications for derived pertaining to public health.

1. The public health professional can motivate T2DM adults to take care of their own health.
2. The public health professional can create awareness regarding Risk assessment, risk reduction, prevention of further complications associated with T2DM.
3. The public health professional can develop strategies to involve family and community members to manage problems of T2DM.
4. The public health professional should promote self-esteem among T2DM.

5. Family counselling can be provided to manage the problem faced by T2DM Adults.
6. Adequate health literacy enhances understanding and using medical information to promote behavior change and self-management.

6.2 Recommendations

1. The study findings showed that the need for health literacy is essential in managing the T2DM Diabetes.
2. The public health professional should use medical information to promote behavior change and self-management.
3. Professional diabetic education should not be a focus on content has to be delivered and approach should be individualized, and outcome based.
4. Competence in the science, theory and research are the underpinnings of diabetic education. By this public health professional using their unique talents, skills, personalities in a therapeutic manner and having meaningful interactions with patients and clients.
5. A comparative study can be done with urban and rural areas.

6.3 Limitations of the study

1. T2DM Adults were concentrating on their own work, not their own health
2. This study did not compare the satisfaction level between doctors and patients
3. This study analyzed only knowledge and awareness but didn't measure cost-benefit analysis of practice adopted by T2DM Adults.

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Appendices

INFORMATION SHEET सूचना प्रपत्र

Namaste: I Mrs. N. Meena kumari, MPH Scholar, IIHMR university conducting a study on **Assessment of Health Literacy among adults with type II diabetes mellitus residing in Jaipur, Rajasthan, India.**” for that your participation may be valuable to me.

नमस्ते मैं श्रीमति एन. मीना कुमारी, एमपीएच स्कॉलर आई आई एच एम आर यूनीवर्सिटी के द्वारा **II** मधुमेह मेलिटस प्रकार वाले वयस्कों के बीच जागरूकता के आंकलन पर जयपुर, राजस्थान में अध्ययन कर रही हूँ। इसमें आपकी भागदारी बहुत ही उपयोगी होगी।

The purpose of this study is to assess of Health Literacy among adults with type II diabetes mellitus residing in Jaipur, the planned duration of participation involves 2 weeks.

अध्ययन का मुख्य उद्देश्य जयपुर में रहने वाले मधुमेह II मेलिटस प्रकार वाले वयस्कों के बीच स्वास्थ्य के बारे में जानकारी का अध्ययन करना है इसमें भागदारी के लिए 2 सप्ताह की अवधि ली गयी है।

I am selecting adults with Diabetes and if you are found eligible, knowledge on Type II diabetes is collected. Expected benefits from this study are adequate knowledge will lead to effective blood glucose control, reduces complications raised by Diabetes and there is no risks associated with the study.

मैं मधुमेह के वयस्कों का चयन कर रही हूँ अगर आप योग्य पाये जाते हैं तो आपसे II मधुमेह के बारे में आपसे जानकारी ली जायेगी। इस अध्ययन से आपको रक्त ग्लूकोज नियंत्रण, मधुमेह से होने वाले खतरों को कम कर सकते हैं। इस अध्ययन में जुड़ने से आपको कोई परेशानी नहीं होगी।

We will not be sharing information about you or your responses with anyone. The information that we collect from this study will be kept private and securely protected. Your information will not serve any other purposes than creating an enabling environment to work effectively. Your identity will not be disclosed in the final report because all the data will be presented after compilation. It will be ensured that nothing recorded will allow the tracing of your identity. Therefore, nobody will ever come to know your identity.

आपके द्वारा दी गयी जानकारी के बारे में किसी को भी नहीं बताया जाएगा। इस अध्ययन के माध्यम से एकत्र की गयी सभी सूचनाओं को गोपनीय एवं सुरक्षित रखा जाएगा। आपके द्वारा दी गयी सूचना कार्यक्रमों के प्रभावशाली क्रियान्वयन हेतु सुगम वातावरण के विकास के अलावा और किसी भी काम में नहीं ली जाएगी। रिपोर्ट में आपकी पहचान को गुप्त रखा जाएगा क्योंकि सभी सूचनाओं को संकलन के पश्चात ही प्रस्तुत किया जाएगा। हम यह सुनिश्चित करेंगे कि आपकी पहचान को कोई जान न सके। इस तरह से आपकी पहचान को कोई नहीं जान पाएगा।

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.

इस अध्ययन के परिणाम आपको अध्ययन के अंत में या बीच में आपको सूचित किया जा सकता है यदि आप में कुछ भी असामान्य पाया जाता है तो प्रबंधन आपकी सहायता कर सकता है।

Whom to Contact: If you have any questions, you can ask now or later. If you wish to ask questions later, you may contact

अगर आपका कोई प्रश्न है तो आप पूछ लीजिए। अगर बाद में पूछना चाहें तो आप इन्हें सम्पर्क कर सकते हैं।

May I speak to you?

Yes ☐ No ☐

क्या मैं आपसे बात कर सकती हूँ?

हाँ नहीं

Signature of Interviewer
साक्षात्कारकर्ता के हस्ताक्षर
Mobile Number-9928026815

Signature of participant
प्रतिभागी के हस्ताक्षर

INFORMED CONSENT FORM सूचित सहमति प्रपत्र

I _____ have read the information in this form I was free to ask any questions and they have been answered. I am over 18 years of age and, exercising my free power of choice, hereby give my consent to be included as a participant in **“Assessment of Health Literacy among adults with type II diabetes mellitus residing in Jaipur, Rajasthan, India.**

मैं _____ ने इस फॉर्म में जानकारी पढ़ी है और मैं किसी भी प्रश्न पूछने और उसका उत्तर देने के लिए स्वतंत्र था और उसका उत्तर दिया है। मैं 18 साल से अधिक उम्र का हूँ और अपनी इच्छाशक्ति का उपयोग कर रहा हूँ। **II** मधुमेह मेलिटस प्रकार वाले वयस्कों के बीच जागरूकता के आंकलन पर जयपुर, राजस्थान में होने वाले आंकलन में प्रतिभागी के रूप में शामिल होने के लिए मैं सहमत हूँ।

I have read and understood this consent form and the information provided to me.

मैंने इस सहमति प्रपत्र में जो भी जानकारी दी गयी है वो पढ़ और समझ लिया है

1. I have had the consent document explained to me.
मुझे सहमति प्रपत्र के बारे में समझाया गया है
2. I have been explained about the nature of the study
मुझे अध्ययन की प्रकृति के बारे में बताया गया है
3. I have been explained about my rights and responsibilities by the investigator.
मुझे जांचकर्ता के द्वारा मेरे अधिकारों और जिम्मेदारियों के बारे में समझाया गया है
4. I have been informed the investigator of all the treatments
मुझे सभी उपचारों के लिए जांचकर्ता को सूचित किया गया है।
5. I have been advised about the benefits/ risks associated with my participation in this study
मुझे इस अध्ययन में मेरी भागीदारी से जुड़े लाभ/जोखिमों के बारे में सलाह दी गई है।
6. I agree to cooperate with the investigator and I will inform him/her immediately if I suffer unusual symptoms.
मैं जांचकर्ता के साथ सहयोग करने के लिए सहमत हूँ और अगर मैं असामान्य लक्षणों का सामना करता हूँ तो मैं उसके बारे में तत्काल सूचित करूंगा।
7. I am aware of the fact that I can opt out of the study at any time without having to give any reason and this will not affect my future treatment in this hospital.
मुझे यह भी पता है कि मैं बिना किसी कारण के भी इस अध्ययन से बाहर निकल सकता हूँ और इससे इस अस्पताल में मेरे भविष्य के ईलाज पर कोई प्रभाव नहीं पड़ेगा।
8. I am also aware that the investigator may terminate my participation in the study at any time, for any reason, without my consent.

मुझे यह भी पता है कि जांचकर्ता किसी भी समय, मेरी सहमति के बिना अध्ययन में मेरी भागीदारी को समाप्त कर सकता है

9. I hereby give permission to the investigators to release the information obtained from me as result of participation in this study to the regulatory authorities, Govt. agencies, and IEC. I understand that they are publicly presented.

मैं इस अध्ययन में नियामक प्राधिकरणों, सरकारी एजेंसियों, और आईईसी को भागीदारी के परिणामस्वरूप मुझसे प्राप्त जानकारी को जांचकर्ता को जारी करने की अनुमति देता हूँ। मैं जानता हूँ कि ये सार्वजनिक रूप से प्रस्तुत किये जाते हैं।

10. I have under stand that my identity will be kept confidential if my data are publicly presented

मैं समझता हूँ कि मेरी सूचना सार्वजनिक रूप से प्रस्तुत की जाने पर मेरी पहचान गोपनीय रखी जायेगी।

11. I have decided to be in the research study.

मैंने शोध अध्ययन में रहने का निश्चय किया है

I am aware that if I have any question during this study, I should contact the investigator. By signing this consent form I attest that the information given in this document has been clearly explained to me and understood by me, I will be given a copy of this consent document.

मुझे पता है कि इस अध्ययन के दौरान अगर मेरे कोई भी सवाल है तो मुझे जांचकर्ता से सम्पर्क करना पड़ेगा। इस सहमति प्रपत्र पर मैं प्रमाणित करता हूँ कि इस दस्तावेज में दी गई जानकारी मुझे स्पष्ट रूप से समझायी गयी है और मुझे समझ में आया है, मुझे इस सहमति दस्तावेज की एक कॉपी भी दी जायेगी।

Signature of the participant_____

प्रतिभागी के हस्ताक्षर

I assure you that, your responses will be used only for stated research study purposes and confidentiality of your response will be maintained strictly.

मैं आपको विश्वास दिलाती हूँ कि आपके द्वारा दी गयी सूचना केवल शोधकार्य के उपयोग में ही ली जायेगी और आपके द्वारा दी गयी सूचना को सख्ती के साथ गोपनीयता रखा जायेगा।

Signature of the Researcher _____

शोधकर्ता के हस्ताक्षर