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Research Article

Association Between Diabetes Mellitus With ABO/Rh Blood Group and Socio-Demographic Factors in Kabridahar General Hospital, Somali Region, Ethiopia

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Abstract: Diabetes mellitus is a metabolic condition characterized by high blood sugar levels due to a lack of insulin secretion, insulin action, or both. This is a multi-factorial disease caused by interactions between genetic, immunological, and environmental variables. Type 1, type 2, and gestational diabetes are the three most frequent kinds of diabetes today. In Kabridahar, Ethiopia, the study was conducted using the case–control technique. Representative samples were chosen using a random sampling technique from people who were asked to provide socio-demographic information and blood samples for blood type identification. Questionnaires were created to capture socio-demographic information that could be linked to diabetes mellitus. There were 401 people in all who participated in the study, with 201 diabetic patients (71 type I and 130 type II diabetic patients) and 202 non-diabetics. There were 223 men and 180 women among the 403 competitors. SPSS version 26.0 was used to analyze the data. The chi-square test of relationships between age, marital status, blood group, family history, and Rh factors with diabetes mellitus revealed a significant association, but not with sex as well as residence. Above 40 years of age, married from marital status, and study participants with a diabetic family history were more susceptible to diabetes, whereas those aged 16–40 years and singles had a lower risk of diabetes than other comparable groups. Type B and A blood types were more predisposed to diabetes mellitus, while blood types O and AB had a reduced risk. Diabetes mellitus was also less affected in people with Rh negative blood. Further research is needed to determine the detail causes of the link between diabetes mellitus and socio-demographic characteristics, blood types, and Rh factors.

Keywords: association, alood group, diabetes mellitus, rhesus factor, socio-demographic factors.

1. Introduction

In diabetes mellitus (DM), the body's capacity to make or use insulin is compromised (WHO, 2019). DM is a chronic, progressive disorder with an unknown cause (ADA,2007). The pancreas produces the hormone insulin, which helps transfer glucose from the bloodstream into cells where it can be metabolized and used as fuel (Tasneem et al., 2021). Survival requires insulin (ADA, 2007). Diabetes mellitus can be classified into two main categories: insulin dependent diabetes (IDDM), also known as Type 1, which is linked to complete insulin deficiency and necessitates the

patient to use external insulin, and non-insulin dependent diabetes (NIDM), also known as Type 2, which has been linked to insulin resistance (ADA,2009; Tasneem et al., 2021).

According to WHO (2006), diabetes mellitus is now acknowledged as a significant public health issue that affects individuals all over the world and is a factor in ill health, premature death, and morbidity. Adult diabetes prevalence was expected to be 4% in 1995 and 5.4% by 2025. (King et al., 1998). By 2025, there will be 300 million adults worldwide who have diabetes, up from 135 million in 1995. The majority of this increase will occur in less developed nations (King et al., 1998). The number of people in developed countries will rise by 42%, from 51 to 72 million, and the number of people in poor countries will rise by 170%, from 84 to 228 million. As a result, by 2025, more than 75% of people with diabetes, up from 62% in 1995, will reside in developing countries (King et al., 1998). The three nations with the highest rates of diabetes will still remain India, China, and the United States in 2025. (King et al., 1998). Ages 45 to 64 make up the majority of diabetics in emerging nations (King et al., 1998). In developed nations, patients with diabetes tend to be older than 65. This pattern will become more obvious by 2025. (King et al., 1998). Diabetes prevalence for all age groups was predicted to reach 2.8 percent in 2000 and 4.4 percent in 2030 by Wild et al. (2004). By 2030, there will be 366 million people living with diabetes worldwide, up from 171 million in 2000. Wild and co. (2004). Males are more likely than women to have diabetes, whereas women are more likely than men to have the disease (Wild et al., 2004: King et al., 1998). The urban population in developing nations is anticipated to double between 2000 and 2030. (Wild et al., 2004). The most striking demographic trend in the incidence of diabetes over the world appears to be the rise in the proportion of persons over 65 years old (Wild et al., 2004).

Ethiopia is the most populous nation in Sub-Saharan Africa, with approximately 2.6 million adult diabetes patients and a diabetes prevalence of 5.2% in 2017 (World Health Organization, 2019). (SSA). With nearly 70% of people having undiagnosed diabetes, economic and sociocultural shifts, as well as childhood malnutrition, are possible triggers (Hailu et al., 2018; Smolen et al., 2016). Recent investigations show that undetected diabetes affected more than one-third of Ethiopian patients treated with hyperglycemic crises (Bedaso et al., 2019; Desse et al., 2015; Abegaz et al., 2018). This raises the possibility that a greater number of people have diabetes and that many more go undetected. T1DM is more prevalent in Ethiopia's rural areas than T2DM, which is more prevalent in the nation's small and big towns (Sachithanan et al., 2013). A recent study conducted in 2015 at the referral hospital for Dilla University found that diabetes type II problems outnumbered diabetes type I diseases (Alemu, 2015).

The most widely used blood grouping system for people is ABO. The two genes A and B, which are present or absent, determine a person's blood group. Most ABO determinants are expressed at the ends of long polylactosamine chains (Daniels et al.,2002). A person's ABO phenotype has been connected to their susceptibility to a number of diseases, even though no diseases have been associated to the absence of expression of ABO blood group antigens. One example of a conflicting link is the higher prevalence of stomach cancer in persons with blood type A compared to gastric and duodenal ulcers in people with blood type O. (Odonnell and Laffan, 2001; Craig et al., 2007). Our study was conducted to look into the lack of information on the

connection between blood types and diabetes mellitus in Ethiopia, particularly in the area under study.

Statement of the Problem

Diabetes is a complex, long-lasting condition that requires ongoing management and interaction with the healthcare system. Diabetes complications can take many different forms if risk factors are not reduced through preventative care. There have been suggestions that the reason why so many people go undiagnosed is due to underperforming healthcare systems, a lack of awareness among the public and healthcare professionals, and other factors. Early and even intermediate diabetes mellitus are asymptomatic, thus it may take years for symptoms to manifest before a diagnosis is made. ABO blood grouping and diabetes mellitus are related genetically. Certain environmental factors may have a significant influence on how their genetic manifestations evolve, and they may be related to one another. The likelihood of having diabetes-related morbidity and mortality may be increased by factors such as age, gender, ethnicity, education, marital status, and unemployment status. The ABO blood group may be associated with an increased chance of developing this condition if there is a positive correlation between these risk factors and the blood group. A defence against diabetes may be the absence of a link. The objective of this study was to determine whether there was a relationship between ABO, Rh blood group, and various socio-demographic characteristics such as gender, age, marital status, and so on, and diabetes mellitus in light of existing demographic risk factors and clinical characteristics of diabetes.

Significance of the Study

According to the researcher, the purpose of this study is to assess the associations between diabetes mellitus and several sociodemographic parameters, including blood group (A, B, AB, and O) and Rh factors. These factors include gender, age, marital status, place of residence, and family history (positive and negative). It will also help in estimating the prevalence of the ABO blood group and the type of diabetes. Because no study has been done to evaluate diabetes mellitus assessment in the study area, as far as the researcher is aware. Future scholars will find this work beneficial as a starting point for more in-depth research on themes connected to the discipline. It is also utilized to give policymakers and planners a baseline of data that will be essential in altering healthcare priorities for planning health services for the poor and reducing adult diabetes mellitus deaths that occur prematurely.

Research Questions

1. What was the prevalence rate of both types of DM in this specific study area?
2. What was the association between ABO blood groups of study participants with diabetes mellitus in the study area?
3. What was the association between marital status and diabetes mellitus in the study area?
4. What was the association between age and diabetes mellitus in the study area?

Objective of the Study

General Objective

- The primary goal of this study was to determine whether there is a link between diabetes mellitus risk factors, blood group, and Rh factors in the study area.

Specific Objectives

- To determine the prevalence of the two diabetes types in the study area.
- To identify socio-demographic factors that increases the risk of diabetes mellitus.
- To assess the distribution of blood groups (ABO and Rh) among diabetic patients.
- -+To examine the existence of association between blood groups ABO and Rh blood groups and diabetes mellitus.

2. Materials And Methods

2.1. Study Area

A woreda in Ethiopia's Somali region is called Kabridahar. Debeweyin borders Kebridehar on the south, Shebelle Zone on the west, Shekosh on the north west, Degehabur Zone on the north, Warder Zone on the east, and Shilavo on the southeast. The zone of Korahe includes it. The principal settlement in Kabridahar Worda is Kabridahar Administrative City. This settlement is located at 6°44′N 44°16′E (6°44′N 44°16′E) latitude and longitude, respectively, and is 1609 meters above sea level. The average elevation in this woreda is 706 meters above sea level (Ethio-GIS arc map,2022).

This woreda has a total population of 136,142 people, with 77,685 men and 58,457 women, according to the Central Statistical Agency of Ethiopia's (CSA) 2007 Census. 50,361 individuals (36.99%) are pastoralists, compared to 29,241 people (21.48%) who live in cities. 987.3% were Muslims. The Ogaden clan of Somalis make up the majority of the population in this woreda.

The Kabridahar General Hospital will be the site of the investigation. It is located in Kabridahar City's Korahe Zone, Kabridahar Woreda. It is roughly 1035 kilometres from Addis Ababa, the capital of Ethiopia, and 380 kilometres from Jigjig, the seat of the Somali regional state. A referral hub for neighbouring district health centres, the hospital is one of the largest healthcare facilities in the Korahe Zone.

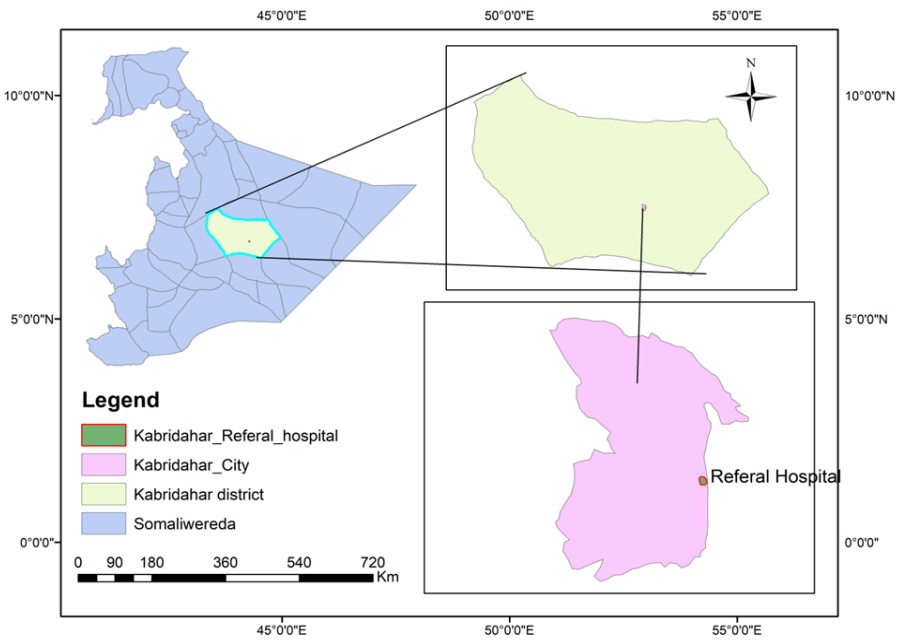

Figure 1. Map of the study area. Source: Ethio-GIS arc map

2.2. Study Design and Period

In order to determine the relationship between blood types and the risk of diabetes mellitus among individuals seeking medical care at Kabridahar General Hospital in Kabridahar, Ethiopia, a hospital-based comparative cross-sectional study will be carried out.

2.3. Population

Source Population

All Kebridehar General Hospital patients served as the source population for cases, and apparently, healthy blood donors and other hospital guests served as the source population for controls in various cases.

Study Population

A case control and random sampling study was carried out at Kebridehar General Hospital. Individuals with a variety of illnesses commonly go to the hospital. From those patient populations, 430 study samples were randomly selected. The control group consisted of 202 additional healthy individuals and the total number of diabetic patients was 201. A controlled unit sample was used to determine the population's distribution of ABO blood groups. All the participants in the study, regardless of their age and gender, participated.

2.4. Sample Size and Sampling Technique

Using a random sampling technique, representative samples were selected from individuals who were asked to provide socio-demographic data and blood samples for blood type determination. Because the prevalence of diabetes diagnosis with specific

blood groups and sociodemographic characteristics was unknown in the study area, P was set to 50% for the calculation. The researcher used a statistical procedure with a 5% level of significance to estimate the sample size (N), and because P was unknown, the calculation used 50% as the exponent.

The formula founds below.

$N=Z^2 P (1-P)/d^2$ (Niang *et al.*, 2006)

1-P=q

N=the minimum required sample size

Z=1.96 at 95% confidence interval

d= margin of sampling error (5% margin error used)

p=prevalence of the association between socio-demographic factors and ABO/Rh blood group with diabetes.

$N= (1.96)^2 0.5 (1- 0.5) / (0.05)^2 =384$

However, to reduce errors due to non-compliance, 5% of the sample size, or 19 study subjects, was added to the regular sample size of 384. As a result, the overall sample size increases to 403.

2.5. Data Collection Methods

Using a semi-structured, previously tested questionnaire, the hospital's skilled nurses will gather socio-demographic and clinical data. To gather sociodemographic data that could be connected to diabetes mellitus, questionnaires were developed. The questionnaire was created after consulting the literature. The creation and translation of a questionnaire into Amharic. The medical staff at the hospital was chosen and instructed in the use of questionnaires for data collection. The information was gathered in the lab concurrently with blood group analysis.

The study was conducted at Kebridehar General Hospital from February to May 2014 E.C. A total of 403 patients were randomly chosen as samples were taken from them, and information was gathered from them. Socio-demographic data and 0.05 ml of venous blood were collected as part of the standard clinic diagnosis when participants volunteered to take part in the study. Blood group ABO and Rh type were determined using the finger-prick method from their third fingers for both diabetics and healthy subjects. They vigorously scrub their fingers with cotton wool that has been rinsed in methylated spirit to disinfect and speed up blood flow before pricking them with a fresh, sterile blood lancet. After this time, a 0.05ml drop of blood is drawn from the testers' and participants' fingertips. Then completely blend in the monoclonal blood grouping reagents Anti-A, Anti-B, and Anti-D with a wooden stick (anti-sera). Incubating for 3–4 minutes at room temperature on the slide will reveal the ABO and Rh (D) phenotypes. The blood reaction starts to agglutinate, or clamp, after the well has mixed and some time has passed.

After combining blood and monoclonal and waiting a few minutes, blood agglutination happened with monoclonal-A. In contrast, agglutination with anti-D monoclonal shows that a person was Rh (rhesus) positive, and the absence of agglutination with anti-D indicates that a person was Rh (rhesus) negative. If this

occurs, the person had an A blood type. After mixing blood and monoclonal and waiting a few minutes, monoclonal B was the only substance that caused agglutination similar to that of blood group A. Rh (rhesus) positive is shown by an agglutination with anti-D monoclonal, whereas Rh (rhesus) negative is indicated by an absence of an agglutination with anti-D. Agglutination of both A and B antisera indicated that the individual belonged to the AB blood group. If there was no evidence of A- or B-monoclonal agglutination, the individual has the blood type O. Using the same techniques used to test the A and B blood groups, the AB and O blood groups were also tested for the Rh factor.

2.6. Data Management and Quality Control

The purpose of the study, consenting, interviewing techniques, laboratory test protocols, and quality control were covered in a one-day training session for data collectors. Data collectors were watched over the course of the data collection period. Professional nurses worked under the lead investigator's supervision to gather clinical and sociodemographic information, and they also conducted daily quality checks on the measuring equipment. To guarantee the quality of the laboratory results, standard operating procedures were followed during the pre-analytical, analytical, and post-analytical phases. Daily quality control samples were taken to guarantee the high calibre of the outcomes.

2.7. Data Analysis and Interpretation

Data was received from the hospital and placed into the SPSS Version 26 program for statistical analysis. Using this program, descriptive statistics, such as bar graphs, frequencies, and the association between factors and diabetes mellitus (as indicated by the chi-square value), were evaluated. Binary logistic regression was used to calculate the strength of each variable category's connection with diabetes mellitus after descriptor statistics for each variable were examined separately.

The variables in the binary logistic regression equation provide details on the importance or contribution of each independent variable category to diabetes mellitus. In this instance, the Wald test was used, and the results showed the statistic value for each analyzed variable. The significant values of each variable were the significant values for Wald statistics. Based on the exponential value of the variable, if the variable's significant value was less than 0.05, we may say that the causes can significantly cause diabetes at a 95% confidence level (B). The exponential value of (B) in this modal variable equation was used to determine the odds ratios (OR) for each independent variable's categories. This odds ratio illustrates how the likelihood of falling into one of the outcome categories changes as the value of the independent variable rises. A binary logistic regression model employed reference categories of 1 to 15 years old, single from marital status, AB from ABO blood group, Rh-from Rh factor, and no from diabetes family history memberships.

2.8. Ethical Considerations

The Research and Ethics Review Committee of the research publication directorate at Kabridahar University gave its clearance. The Kabridahar General Hospital will

provide its clearance. The hospital's authorized bodies were fully informed of the study's objectives. A consent form was signed by the director of the DM clinic and the medical director of the hospital. No unauthorized personnel had access to the data being collected, and study participants were identified using codes to protect data confidentiality. Each participant's clear written consent was received before any data was gathered. Participants benefited from the study since it informed them about their blood types and cholesterol levels. If your lipid profile is abnormal, they were informed.

3. Result

3.1. Prevalence of Diabetes Mellitus

A total of 403 study individuals took part in this investigation, with 202 of them being non-diabetics and 201 being diabetics. Type 2 diabetes mellitus was more common (130), while type 1 diabetes mellitus was less common (70) (table 1).

Table 1. Frequency distribution of each variable

Variable	Independent Variable category	Each diabetic case frequency and proportions		Total diabetic case frequency and proportion	Non-diabetic case frequency and proportions (control group)	Total diabetic and non-diabetic case frequency and proportions
		T1 DM	T2 DM			
Sex	Female	33(33.0%)	63(67.0%)	96(46.8%)	84(41.6%)	180(44.2%)
	Male	38(37.4%)	67(62.6%)	105(53.2%)	118(58.4%)	223(55.8%)
Age	age1-15	40(100.0%)	0	40(19.9%)	64(31.7%)	104(25.8%)
	age16-40	26(41.3%)	37(58.7%)	63(31.3%)	103(50.5%)	165(40.9%)
	age >40	5(5.1%)	93(94.6%)	98(48.8%)	36(17.8%)	134(33.3%)
Blood group	AB	0	4(100.0%)	4(1.5%)	20(10.4%)	24(6 %)
	B	28(50%)	28(50%)	56(27.9%)	47(23.3%)	103(25.6%)
	A	15(34.9%)	28(65.1%)	43 (21.9%)	36(17.3%)	79(19.6%)
	O	28(35.89%)	50(64.11%)	78(38.8%)	119(58.9%)	197(48.9%)
Rh factors	Rh-	3(16.7%)	15(83.3%)	18(9%)	40 (19%)	58(14.4%)
	Rh+	68(37.2%)	115(62.8%)	183 (91%)	162(80.2%)	345(85.6%)
Marital status	Single	59(100%))	0	59(29.4%)	83(41.1%)	142(35.2%)
	Married	12(10.2%)	106(89.8%)	118(58.7%)	107(53.0%)	225(55.8)
	divorced/widowed	0	24(100%)	24(11.9%)	12(5.9%)	36(8.9%)
Residence areas	Rural	16(31.4%)	35(68.6%)	51(25.4%)	68 (33.7%)	119(29.5%)
	Urban	55(36.7%)	95(63.3%)	150(74.6%)	134 (66.3%)	284(70.5%)
Having or not diabetic Family history	No	3(2.3%)	129(97.7%)	133(66.2%)	166(82.2%)	299(74.2%)
	Yes	68(98.6%)	1(1.4%)	68(33.8%)	36(17.8%)	104(25.8%)

There were 223 men (55.3%) and 180 women (44.7%) among the 403 participants. Female diabetic case participants were affected by type 1 diabetes mellitus in 31.0% of cases and type 2 diabetes mellitus in 63.0% of cases. Type 1 DM attacked 40 (37.4%) of the male subjects, while type 2 DM attacked 67 (62.6%) see table 1.

Three age groups of participants in the study were created: 1 to 15 years old, 16 to 40 years old, and over 40 years old. Ages 16 to 40 made up the bulk of participants, with

people over 40 coming in second. Non-diabetes ranged in age from 16 to 40, but the majority of diabetics were over 40. The individuals' marital status was an important factor to consider. This variable has three categories: single, married, and divorced/widowed. The married status had the highest frequency of participants, both diabetic and non-diabetics, and the divorced/widowed status had the lowest frequency. Diabetes mellitus was linked to marital status in a substantial way.

Sex (gender) and place of residence were the two variables that were evaluated but had no significant association with diabetes mellitus. All of the people in this study lived in rural and urban areas. Type one diabetes mellitus (T1DM) was less common in both rural and urban areas, whereas type two diabetes mellitus (T2DM) was more common in both urban and rural areas.

3.2. Association between Blood Groups and Diabetes Mellitus

Association between ABO Blood Groups and Diabetes Mellitus

In the sampled population, distinct blood types are more or less common in the diabetes and non-diabetic categories (table 1). The frequency of ABO blood types ranged from 119, 47, 36, and 20 for O, B, A, and AB blood groups in the non-diabetic population to 78, 56, 43, and 4 for O, B, A, and AB blood groups in diabetic individuals.

In the entire population, blood group O was the most prevalent (197), followed by blood group B. (103). There were 119 persons without diabetes and 78 people with diabetes. In blood group B, there were 56 diabetics and 47 non-diabetics. With 79 participants in the study possessing blood group B, blood group A was the third most prevalent blood type. In this blood group, there were 47 diabetic patients and 36 non-diabetic people. The blood type with the lowest frequency, the fourth AB blood group, was shared by all study participants. Twenty healthy volunteers and four diabetes patients made up this blood group. None of the four individuals in this blood group had type one diabetes; instead, type two diabetes has been identified in each of them.

Table 2. Association between blood group and diabetes mellitus

Blood group	Diabetics case		Non-diabetic case	Total frequency	P value
	Type one	type two			
AB	0	4	20	24	0.190
B	28	28	47	103	0.049
A	15	28	36	79	0.051
O	28	50	119	197	0.041

The blood group was significantly associated with diabetes mellitus at X2 (3, n = 403) = 12.076. Between blood group and diabetes mellitus, the chi-square p value was 0.007. In the blood AB group categories, however, there was no significant variation in frequency between diabetics and non-diabetics. In the blood B, A, and O groups, however, there was a significant frequency difference between diabetics and non-diabetics. The B and A blood types were more prevalent in diabetic patients. The blood types O and AB were more widely distributed among non-diabetic control trial

participants. The values of exp (B) = 0.037, 0.059, and 0.065 for the O, B, and A blood groups, respectively, contribute significantly to diabetes mellitus at a 95% confidence level. According to this, the odd ratio of DM in the O blood group was 0.037 times higher than in the blood AB group, the odd ratio of DM in the B blood group was 0.059 times higher than in the blood AB group, and the odd ratio of DM in the blood A group was 0.065 times higher than in the blood AB blood group. As a result, the blood A, B, and O groups were the most important factors in determining whether or not a person had diabetes.

Association between Rhesus Factors and Diabetes Mellitus

The Rh (Rhesus) factor was the second clinical determinant that could influence diabetes mellitus frequency. Three hundred and forty-five (85.6%) of the people in the study were Rh positive. In 58 of them (14.4 percent), they were Rh negative (see table 1).

Table 3. Association between Rhesus factors and diabetes mellitus

	Diabetics case		Non-diabetics case	Total	P. value
Rh factors	Type one	Type two			
Rh negative	3	15	40	58	0.240
Rh positive	68	115	162	345	0.027
Total	71	130	202	403	

Only three people with type one diabetes were Rh negative, while 15 people with type two diabetes were Rh negative. There were 68 (37.2%) type one Rh+ diabetics and 115 (62.8%) type two Rh+ diabetics among the diabetic patients. In the non-diabetic group, 162 (80.2%) were Rh positive, while 40 (19%) were Rh negative.

In diabetics, the most common Rh+ blood group was O+, which accounted for 92 percent of the population, followed by B+, which accounted for 50 percent, and AB+, which accounted for only five percent. Non-diabetic Rh+ blood groups had 84, 36, 31, and 13 for O+, B+, A+, and AB+, respectively, but Rh-diabetic cases had 7, 7, 2, and 0 for O-, B-, A-, and AB-, and non-diabetic cases had 15, 11, 8, and 4 for O-, B-, AB-, and A-, respectively.

At X^2 (1, n = 403) = 9.621 was the chi-square value for Rh factor and diabetes mellitus. The p value for this chi-square was 0.002. At 95 percent confidence interval (Rh p value = 0.002), the value of exp (B) = 0.673 contributes significantly to diabetes mellitus (Rh p value = 0.002). odd ratio of DM in Rh positives was 0.673 times higher than in Rh negatives.

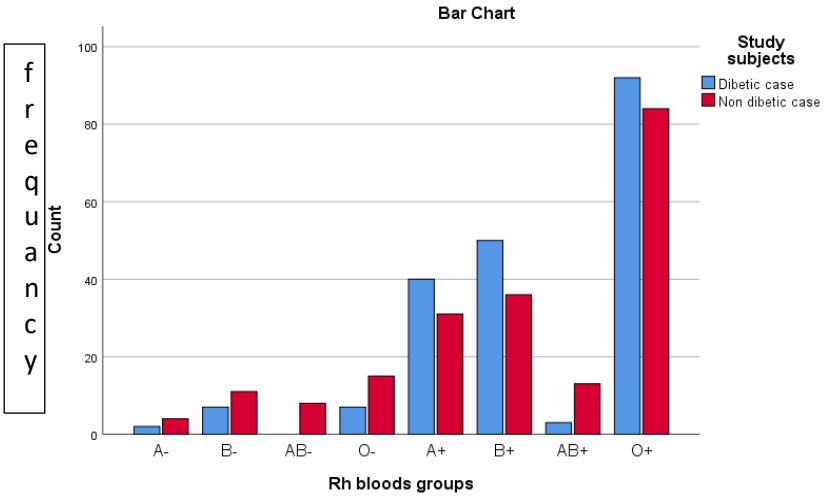

Figure 2. Rhesus factors distributions

3.3. Association between Diabetes Mellitus and Socio-demographics Factors

Association between Sex and Diabetes Mellitus

There were 223 (55.3%) males and 180 (44.7%) females among the 403 study participants. Diabetes mellitus was not shown to be connected with a person's gender. X2 (1, n=403) =1.097 was the chi square value between sex and diabetes. Between sex and DM, the chi-square p value was 0.295. As a result, males were more common in diabetes cases than females (105(53.2 percent) vs. 96(46.8%); P > 0.05); similarly, males were more common in healthy populations than females (118(58.4 percent) vs. 84(58.4 percent); P > 0.05). (41.6 percent).

Association between Age and Diabetes Mellitus

Another socio-demographic factor that was examined was participant age; among diabetes patients, those over 40 made up the biggest proportion of study participants, accounting for 98 (48%), followed by those between the ages of 16 and 40, who made up 63 (31.3%). The lowest frequency was found in the group of children aged 1 to 15, where there were 63 (31.3%) subjects (Table 1). Nonetheless, the bulk of the health subjects (103; 50.5%) were between the ages of 16 and 40. They were followed by those between the ages of 1 and 15 (64; 31.7%), and those who were older than 40.

The relationship between age and diabetes mellitus was likewise significant in the chi-square test, with X2 (2, n=403) =43.441. The chi-square p value between age and diabetes mellitus was 0.00. Though there was a significant frequency difference between diabetics and non-diabetics (p< 0.05) in the first three age groups, the 16-40-year-old group was significantly more common in non-diabetic cases than diabetic cases (50.5 percent vs 31.3 percent; P < 0.05), whereas the above 40-year-old group was significantly more common in diabetic cases than healthy population (48.8 percent vs 17.8 percent P< 0.05). At a 95% confidence interval, the values of exp (B) =0.732 and 0.111 for 16-40 and >40 years old, respectively, can contribute considerably to diabetes mellitus. According to this, the odd ratio of DM in 16-40 years old was 0.732 times higher than that of above 1-15 years old, and the odd ratio

of DM in the second category >40 years old was 0.011 times higher than that of above 1-15 years old.

Association between Marital Status and Diabetes Mellitus

Both diabetics and non-diabetics are divided into three groups based on their marital status: single, married, and divorced/widow (Table 1).

Married groups had the highest frequency of all survey participants, with 225 (55.8%) having the highest frequency. In contrast to this group, the divorced/widowed category had the lowest frequency, with 36 (8.9%) individuals. The majority of diabetics were also married, with 118 (58.7%) being married and 59 (29.4%) being single.

According to the chi-square value of X2 (2, n=403) =8.592, marital status was significantly associated with diabetes mellitus, with a chi-square p value of 0.014. Though married and divorced/widowed categories were more common in diabetic cases and did have a frequency difference between diabetic and non-diabetic groups (118(58.7%) vs 107(53.0%) and 24(11.9%) vs 12(5.9%), singles groups were more common in non-diabetic cases as compared to diabetic cases (83(41.1%) vs 59%). (29.4%). The values of exp(B) = 0.878 and 1.834 in married and divorced/widowed individuals, respectively, contribute significantly to diabetes mellitus at the 95 percent confidence interval. According to this, married persons were 0.878 times more likely than single persons to have an odd ratio of DM, and divorced and widowed persons were 1.834 times more likely to have an odd ratio of DM than single persons.

Association between residence and diabetes Mellitus

There were two types of residences: urban and rural. 284 (70.5%) of the total sampled population lived in cities, while the remainder 119 (29.5%) lived in rural areas. In terms of diabetes prevalence by place of residence, the majority of diabetics (150/74.6%) lived in cities, while the remainder diabetics (51(25.4%) lived in rural areas. Type one diabetics made up 55 (68.6%) of urban diabetic patients, while type two diabetics made up 95 (63.3%). There were also 16 (31.4%) type one diabetics and 35 (68.6%) type two diabetics in rural areas.

X2 (1, n=403) =3.328 was the chi-square test between diabetes mellitus and residence. As a result, there was no statistically significant link between residence and diabetes at p 0.680, which was greater than 0.05.

Association between family history and diabetes mellitus

The family history of all sampled people was also considered as an independent variable. In this category, 105 people (or 25.8%) had diabetic family members, while the other 299 people (74.2%) did not. People with diabetes had diabetic family members in 69 (33.8%) cases. There were 68 (98.6%) type 1 diabetics and one (1.4%) type 2 diabetic among them.

According to the chi-square value of X2 (2, n = 403) = 13.486, having or not having family membership was significantly related to diabetes mellitus, with a chi-square p value of 0.000. Although, based on this variable, diabetic family membership categories were not more common in non-diabetic cases, and there was a frequency difference between non-diabetic and diabetic groups of 166 (82.2 %) vs 133 (66.2%) at p value 0.034. At the 95% confidence level, the value of exp (B) = 0.267 in having

diabetic family membership contributes significantly to diabetes mellitus. As a result, the odd ratio of DM in having a diabetic family member was 0.267 times higher than in not having a diabetic family member.

4. Discussion

4.1. Association between blood groups with diabetes mellitus

Among the socio-demographic factors examined, it was discovered that age, marital status, and family history were significantly correlated with diabetes mellitus. Sex and place of residence, however.

Association between ABO Blood groups and diabetes mellitus

Several studies have been conducted to determine whether there is a relationship between T2DM and its associated factors and the phenotypes of the ABO and Rh blood groups. The results were found to be inconsistent and variable between studies (Sukalingam and Ganesan, 2015). The results of the current investigation supported the hypothesis that the chance of developing diabetes mellitus is correlated with ABO blood group characteristics.

O blood type was the most prevalent among non-diabetic individuals, although A and B blood types were significantly more prevalent in diabetics, and AB blood types were the fourth most prevalent in both groups of patients without a significant difference in frequency.

The results imply that the human ABO locus may affect endothelial or inflammation markers, such as the factor VIII (von Willebrand factor (vWF)) complex, which is present in higher levels in non-O individuals. The human ABO locus may also influence endothelial or inflammation markers, such as the factor VIII (von Willebrand factor (vWF)) complex (Legese, et al. 2010). Similar results were found in studies conducted in Saudi Arabia and Qatar (Bener and Yousafzai, 2014). (Meo et al. 2016). However, blood groups B and A were less likely than other blood groups to develop T2DM, according to a study carried out in Pakistan (Waseem, et al. 2012). Geographical and racial disparities may change how diseases manifest genetically and how often people have ABO blood type antigens, which could account for the observed disparity (Dodiya et al. 2016).

Other Scientists Qureshi and Bhatti examined the prevalence of ABO blood groups among type 2 diabetics in 2003 and came to the conclusion that there is a strong genetic immunologic basis linking type 2 diabetes and blood types. They claim that type 2 diabetics had much higher and lower rates of blood types B and O, respectively, than the general population, which is consistent with the results of this study (Qureshi and Bhatti, 2003).

This analysis found no connection between diabetes and the blood group AB. While another study in India (Aggarwal et al., 2018) discovered that T2DM patients had a greater AB blood group than healthy controls, research from Egypt (El-Sayed and Amin, 2015) found that blood group AB was protective against T2DM. Differences in the research area's geography, genetics, and environment could be to blame for this heterogeneity.

Association between Rh Blood Groups and Diabetes Mellitus

Rh negative blood groups were more prevalent in non-diabetics than in diabetics, although there was no discernible difference in frequency, but Rh positive blood groups were much more prevalent in diabetics. Contrary to this study, another one revealed that diabetics in our population had much higher rates of Rh negative than did controls (Can et al., 2016). A comparable study was out in Namakkal town discovered a significant difference in the incidence of Rh positive in the diabetes and control groups (p 0.05). (Kumar et al., 2014). According to the current research, diabetes mellitus and the Rh factor are related. Similar findings about a connection between T2DM and Rh-negative blood types were made by Pakistani researchers (Waseem et al., 2012). A study conducted in India presented difficulties for this study (Aggarwal et al., 2018; Dali et al., 2014). On the other hand, a study from Iran (Al-Ali, 2008) discovered a positive relationship between T2DM and Rh-positive blood types. In our investigation, a significant relationship between the blood types O+, B+, and A+ and the risk of diabetes was discovered. Those with blood group B+ have a higher chance of developing diabetes, according to two separate studies—one from Nigeria and another from France (Fagherazzi et al., 2012). (Okon et al., 2008). A study that examined both types of diabetes found that the O+ blood group was significantly lower in diabetic patients than in the control group. Yet, our research revealed that diabetes patients had larger levels of the O+ blood group than did healthy individuals.

4.2. Association of Socio-demographic Factors with Diabetes Mellitus

Association between Sex and Diabetes Mellitus

The first socio-demographic aspect of the sample population that was highlighted as a result of this study was gender. According to the results, there was no discernible difference in the prevalence of DM between diabetics and non-diabetics, and it was similar in males and girls. The results show that gender is not a risk factor for developing diabetes mellitus. But according to a number of studies, men and women who store their fat differently—men in the area around their belly, while women store it in their hips and thighs—are more likely to develop this illness (Longue J. et al. 2011). There are no appreciable variations in type 2 diabetes risk between men and women, according to other studies. This indicates that there was no difference in prevalence between men and women in the population under study (Gale and Gillespie, 2001).

In contrast, a Middle Eastern and developing civilizations study found that Iranian and Middle Eastern women were more adversely affected (Gupta et al., 2003; Azimi et al., 2008). This might be related to variations in location and way of life.

Association between Age and Diabetes Mellitus

There was a statistically significant difference in the prevalence of DM between the 16–40 age group and the oldest category for this variable (over 40 years old). According to a second study that supports this results, the prevalence of diabetes increased with age, inactivity, central obesity, and BMI, leading to a greater DM rate

among the elderly (Harris et al., 1987). According to other study, the likelihood of developing diabetes rises with age (Azimi et al., 2008).

According to a different study, T2DM prevalence increases with age. Age was the most important risk factor in the sample. Around the age of 60, dysfunction of the Islet of Langerhans beta cells is evident due to an increase in the pro-insulin to insulin ratio, which is the ratio of the insulin precursor to the insulin (Bryhni et al., 2010). Islet dysfunction is indicated by this elevated ratio. Advanced glycation end products (AGE), a buildup of sugar-derived substances that increases in direct proportion to blood glucose levels, are associated with aging. An increase in these molecules (AGE) affects the signal transduction pathways involved in the opening of the GLUT channels as well as the sensitivity of the insulin receptors themselves (Peppa et al., 2003). As a result, this adds to the aging-related insulin resistance. Another sign of aging is sarcopenia, which is the loss of muscle fibres (mainly type 2 muscular fibres). These muscles once had the capacity to absorb and digest glucose, but that ability has been gone (Nayak et al.,2014).

Association between Marital Status and Diabetes Mellitus

This study found that DM prevalence was considerably higher in married, divorced, and bereaved individuals than in single individuals. Another research (Redhwan et al., 2017) identified a strong relationship between marital status and diabetes practice score, with married and retired persons having better diabetes practice.

In a study that refuted this conclusion, married people's prevalence of DM and PDM was not significantly different from that of other subgroups (Karamatollah et al., 2013). Another inquiry likewise reported a similar result (Azimi et al., 2008). However other data suggested that marital status—single, divorced, or widowed—is substantially connected to DM (Bréchon et al., 2005), which partially corroborated the results of this study.

The case for a connection between marriage and improved health outcomes has previously been made. Due to the impact of marriage connection on health behaviours and socioeconomic status, several studies have indicated a decreased incidence of diabetes (Johnson 2000) and increased adherence to diabetes therapy (Haines et al., 2018) among partnered patients. The effect of marital status on T2DM seems to be gendered even though there was no difference in T2DM incidence between men and women in our sample. Women who had recently been divorced or widowed had the highest mortality rate in a recent study on the mortality of diabetes in a large Spanish population, while single men had the highest mortality rate (Escolar et al., 2018). Another study that examined the incidence of T2DM discovered that widowed women had a lower risk of having the disease than married women (Ramezankhani et al., 2019). The effect of being married appears to be gender-neutral. Only those who remained married or got married throughout the 5-year follow-up, per the findings (Espinosa, 2008), experienced a considerable weight gain, which was associated with a higher risk of developing T2DM. The danger connected to marital status was unaffected even after this alteration. In actuality, those who remained married despite increasing weight had a lower risk of developing diabetes than those who had divorced. There are two basic explanations for why marriage is beneficial to your health. The first has to do with "selection" because healthier individuals are more

likely to get married and stay married. The second theory relates to the post-marriage effect and focuses on stress reduction and adopting healthy behaviours (Umberson, 1992; Wyke and Ford 1992). Both options are likely to have had an effect on the formation of DM, even if we were unable to decide which was more reasonable in our research.

In this setting, Cornelis and coworkers conducted a thorough study over a 22-year period with a large number of males and discovered that widowhood was significantly associated with an increased risk of T2DM after multiple models of adjustment, including lifestyle, BMI, family history, and other variables (Cornelis et al., 2014). This study examined widowers and divorced/separated individuals separately, which was crucial because widowhood and divorce may have different stressful effects (Eng et al.,2005). Men who became widowers drank more alcohol, while men who were divorced or separated ate less vegetables and had lower BMIs. Further research is required to ascertain whether the relationship between marital status and DM risk has changed since these factors have an effect on DM.

Association between Residence and Diabetes Mellitus

Studies show that type 1 and type 2 diabetes are becoming more prevalent, substantial, and dangerous public health problems for people living in both urban and rural areas, with urban areas having the highest prevalence (Nanditha et al., 2019). Studies in Ethiopia, Burma, India, and Peru have found that urban regions have a higher prevalence of diabetes than rural ones do (Nanditha et al., 2019). Living in a remote area increases the risk of acute diabetes complications and treatment gaps, which have an impact on health outcomes and access to care (Nanditha et al., 2019).

This study found no evidence of a significant relationship between residency and diabetes mellitus. Nonetheless, the study's T1DM and T2DM distributions show regional heterogeneity. T1DM was more common in rural regions, but T2DM was more common in cities. This conclusion is supported by a similar study done at the University of Gondar referral hospital, which found that Type 1 DM patients were much more prevalent in rural areas than in urban areas, while Type 2 DM patients were significantly more prevalent in urban areas than in rural ones (Lester, 1986).

This result conflicts with previous findings, such as those of a study carried out in a rural area with people who were thought to have poor incomes and levels of education as well as a high prevalence of diabetes mellitus (Dudzinska et al., 2013). Given recent studies that demonstrates elements that are currently emerging and are closely linked to rural poverty, diabetes may in the future emerge as a disease of poverty and high prevalence rather than a disease of wealth (Banerjee et al., 2012). Another very high incidence of diabetes has been recorded in India's urban areas, but the majority of the country's population resides in rural areas, where data are scarce (Ramachandran et al., 2001). This is a result of rural populations gradually adopting urban lifestyles and sedentary behaviours (Amitav, 2014).

According to certain studies, like one conducted in Poland, there is no discernible difference in the standard of diabetes care provided to residents of urban and rural areas, supporting the conclusions of this study (Marta et al., 2013).

Contrary to our findings, a 2017 survey by the International Diabetes Federation in the Yangon Area found that the prevalence of diabetes was somewhat greater in urban

regions and slightly lower in rural areas. Metropolitan areas often have a greater incidence of diabetes than rural areas do around the world (International Diabetes Federation, 2017). Obesity and noncommunicable diseases like diabetes, as well as changes in eating patterns, physical activity, smoking, and alcohol intake, are all associated with urbanization. Although urban areas are affected earlier and more severely, lifestyle changes that precede NCDs affect people in both urban and rural settings. Also, this study's findings on the prevalence of diabetes mellitus were lower than those that were previously reported in the same study (Htet et al., 2016). This is due to the fact that although earlier studies provided age-adjusted results based on the internal (Myanmar) standard population, the results of the current study were age-adjusted based on the population of the Yangon Region using Myanmar Census data from 2014. Due to young people moving to Yangon for educational and employment opportunities, the population of the Yangon Region is very young. According to earlier studies among Asian Indians and Chinese people, diabetes was more common as people aged in the Yangon Area (Ramachandran, 2012). In urban regions of the Yangon Region, DM was more common among those with no formal education or little schooling than among those with a greater level of education. Urban areas have significantly higher educational levels than rural areas, which would account for why this trend wasn't seen there. There has been evidence of a DM educational gradient in low-, middle-, and high-income countries (Agardh et al., 2011). Lack of knowledge may be associated with impediments to accessing healthcare, learning about diabetes, and making good lifestyle decisions for oneself (Agardh et al., 2011).

Even after taking into account potential confounders, one study indicated that city dwellers had a higher chance of developing diabetes than those who lived in rural areas. The relationship between urban stress and DM is one likely explanation. Overcrowding, unemployment, substandard housing, poverty, competition, and cultural displacement affect city people on a daily basis, leading to stress illnesses like anxiety and depression (WHO, 2010). Long-term stress has been associated with diabetes due to elevated cortisol levels and decreased sex hormone levels, which interfere with insulin action (Lloyd et al., 2005; Kawakami et al., 1999). (Bjorntorp, 1991).

Association between Family History and Diabetes Mellitus

Another significant socio-demographic characteristic of the examined group was their family history. A substantial risk factor for the illness has been discovered as having diabetes in the family. Understanding genomic information required knowledge of family medical history since it described the complex interplay between environmental, behavioural, and genetic factors. The impact of a shared environment, common habits, and genetic susceptibility are reflected in the family history of numerous diseases (Das and Ghosh, 2012).

This study demonstrated a strong relationship between diabetes mellitus and the population's family history. This is in line with other research, such as one done in the US, which discovered that persons with two diabetic parents had a risk of developing diabetes that was more than double that of adults with only one diabetic parent (Meigs et al., 2000). Similar findings were made by Pierce et al. (2001), who also discovered that having a family history of diabetes was associated with type 2 diabetes (T2DM)

and that participants with a family history of the disease had a higher rate of awareness of diabetes risk factors than the other groups (Yanyan et al., 2017).

5. Conclusions And Recommendations

Conclusions

Although socio-demographic characteristics like age and marital status showed a substantial correlation with diabetes mellitus, family history and place of residence did not. Over forty-year-old diabetics made up the majority of those who were affected. Those between the ages of sixteen and forty were shown to have a higher prevalence of type one diabetes mellitus, as well as the majority of non-diabetes mellitus cases. Most patients with type 2 diabetes are diagnosed with it after they are 40. Compared to married and widowed adults, those who were single had a decreased risk of developing diabetes (divorced). Blood types B and A had a higher risk of developing diabetes mellitus than other blood types, however blood type AB had a lower risk of developing the condition. Significant variations were seen in O blood groups more frequently in control groups than in diabetes individuals, nevertheless. Most study participants were Rh positive, however only Rh positives revealed a substantial distinction between those with diabetes and those without it. Only a few Rh-negative individuals with type 1 diabetes participated in this study.

Recommendations

- Based on the findings of this study, Further research is needed to determine why ABO blood types, Rh factors, sex, age, and marital status are linked to diabetes mellitus.
- Pathophysiological study is also needed to figure out why those with the B and A blood groups are more likely to develop diabetes, whereas those with the blood group AB have a lower risk.
- It would be beneficial to do comparable studies in a large sampled population from various parts of Ethiopia in order to study more about the relationships between sociodemographic factors, ABO/Rh blood groups, and diabetes mellitus.
- Additional variables such as obesity levels, environmental factors, educational status, diet and feeding habits, and their associations with diabetes mellitus should be included in future studies.

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