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Survival Time of Diabetic Patient under Treatment at Wolaita and Dawuro Zones, South Ethiopia.

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Abstract

Background
Diabetes is a chronic disease for which there is currently no cure. Type 1 diabetes (T1D) patients need insulin replacement therapy to survive, but glycaemia is not always properly regulated. There were over 2 million cases of diabetes in Ethiopia in 2014 and 32,262 adults dead in due to diabetes.

Methodology
Institutional based retrospective study design was carried out on data obtained from Ottona and Tercha Referral Hospitals, in WolaitaSodo and Dawuro zones of the SNNPR with diabetic patients who start treatment and were on follow up in both Hospital from January 2008 to August 2015.A total of 682 patients were involved in the study from both hospitals and Cox proportional hazard model was use to examine survival time of diabetic patient. Kaplan-Meier estimators were applied to estimate survival curves of diabetic patient and the log rank test were used for the comparison between the variable categories.

Result
Diabetic patient with sex of females had higher survival compared with men, healthy body mass index,and Diabetic patient with normal blood pressure. Among different diabetic categories, type 1 DM patients had the lowest survival time than those type II diabetic patient. There is increased risk of death form male patient, type I diabetic patient, positive family history of diabetic mellitus, high blood pressure patient, patient with cardiac complications, patient with eye complication and neurologic complication.

Conclusion
The main predictive factors for the survival probability of DM patients are more of clinical variables. Health workers should be cautious when a patient has uncontrollable and high blood pressure, overweight body mass index, high fasting blood sugar and different DM complications.

Keywords: Diabetes mellitus, Diabetic patient, survival time, Cox proportional hazard

Introduction

Diabetes mellitus (or diabetes) is a chronic, lifelong condition that affects both the survival and body's ability to use the energy found in food of a person [1]. There were over 2 million cases of diabetes in Ethiopia in 2016[2]. Diabetes is a major and growing public health problem affecting more than 171 million people worldwide and the number is expected to rise to 366 million by 2030 [3-5].

Although Diabetes mellitus (DM) is a serious and growing health problem worldwide and is associated with severe acute and chronic complications that negatively influence both the quality of life and survival of affected individuals [6-7]. So far 387 million people have diabetes in the world and more than 22 million people in the Africa Region and **Ethiopia** is one of the 32 countries of the international diabetic federation in Africa region. There were over 2 million cases of diabetes in Ethiopia in 2014. There were 32,262 adults dead in Ethiopia due to diabetes [8-10].

In the developed world Type 1 diabetes (also referred to as Insulin Dependent Diabetes Mellitus) in children is no longer a death sentence and describes how 98% of Type 1 patients in the USA are alive six years after diagnosis but only 1% of children currently survive six years. In sub-Saharan Africa and Ethiopia is one of sub-Saharan Africa country[11-12]. Based on the mortality estimate made by WHO in 2016, it is stated that among all death of all age group diabetic contributed it 1% of all death [13].

To reduce the mortality and morbidity rate caused by the diabetes different initiatives were made by international organizations. One of the imitative was the Ethiopian Diabetes Association which was established on January 23, 1984 G.C (1976E.C) for the purpose of providing a forum to diabetes patients so that they can discuss ways of prevention, the provision of information and treatment for all affected by diabetes. The initiative came from Ethiopian Medical Association, health care professionals and people who live with diabetes at the time. It is the first patient based association in the country [9].

Diabetics patient may live longer and may get into different medical complications. This can be a challenge for the quality of life of the patient. Nevertheless, the deterioration of the patients' quality of life and even death can be much delayed with the knowledge of factors that may contribute to it[14-15].Acceptable diabetes care has an inclusive and more comprehensive scope. This it also includes preventing and treating life-threatening end organ damage due to diabetic complication[16-18].

Even though health workers try to control fasting blood sugar level, there are many questions which can be raised by everyone that what factors contribute for controlling fasting blood sugar level of diabetes patients[19].Past researches shows that initial weight, BMI, alcohol use, tobacco use, BP, type of diabetic disease diagnosed, cholesterol level, complication of DM, FBS and family history of DM were major factors related to survival time of diabetic patient [20-23].

However, most of the studies in Ethiopia focused on the prevention and about factors that increase the chance of contracting the disease. And little work has been done on survival time of diabetic patients so this study used Cox proportional hazard model were used to examine survival time of diabetic patient. Kaplan-Meier estimators were applied to estimate survival curves of diabetic patient and the log rank test will use for the comparison between the variable categories (24).

This study attempted to identify factors that have strong associations with the survival experience of diabetic patients under treatment in one of the government hospitals in the regional state of SNNPR at Wolaita Sodo in Ottona and Tercha Hospital.

Hence, the current study is supposed to answer the following basic questions:

1. What are the factors that affect survival time of diabeticpatient?
2. What is the estimated survival time of diabetic patients among some covariates?
3. How to compare survival time of diabetic patients by using log rank test?

Methods

Study Area and period

The study is based on data obtained from Ottona and Tercha Referral Hospitals, in WolaitaSodo and Dawuro zones of the SNNPRfrom January 2008 to August 2015. The Hospitals are run by the SNNPR Government Health Bureau. Currently Tercha

Hospital is giving service to more than 28,318 people of Which 872 are diabetic. In addition, Ottona Hospital is a training center for health science students. The diabetic clinic has currently three physicians, three nurses and two data clerks attending diabetic patients regularly and filling the follow up charts more or less appropriately.

Sampling Design and Technique

For this study retrospective study design were employed. The sample size is determined by assuming a 0.78 oldest 0.605 new HR and sd=0.247 and n=682 hazard ratio (Effect size) associated with a one unit increase in covariate interest which death of diabetic patient when other covariates held constant, and 95% confidence interval of certainty ($\sim = 0.05$) the number of subject needed to achieve power of 90% and assuming no subjects anticipated to withdrawal from the follow up. This was done using the formula

$n = (Z_{\frac{\sim}{2}} + Z\ \ )^2 / ®_1 ®_2 (\ln HR)^2$

Where, n is the number of sample size, $\sim = 0.05$, $= 0.10$ (power = 90%), $®_1$ and $®_2$ are the population proportion to be allocated to any two groups. Assuming equal allocation between these groups we have $®_1 = ®_2 =$ 1/2. Based on this assumption, sample size estimation for the assessment of survival time under the cox-proportional hazard model is computed using the above formula or STATA statistical package. The total sample size required is 683 to achieve 90% power. Simple random sampling without replacement technique were employed to fulfill the desired patient's record.

Population

The target population for this study were diabetic patients who start treatment in both Ottona Referral Hospital and Tercha Hospital. Patients who are enrolled within the study period were included in the study and those Patients who were referred to were excluded.

Data collection instrument and procedure

The study is based on the review of follow up cards of diabetic patients taking the treatment. The patient charts are prepared by Federal Ministry of Health to be uniformly used by clinicians to early identify and document clinical and laboratory measurement. Thus, this study will use secondary data obtained from patient follow up card based on the questionnaire designed to extract only the variables to be considered in this study.

Variables considered in the research

The response variables:

"Time" (Survival time of patients in months) and "Status" (dead=1, Censored=0)

The independent variables:

Several predictors were considered in this study to investigate the major factors associated with survival time of diabetic patients. This includes

1. Gender of patients
2. Age of patients
3. Diabetic types
4. Family history
5. Blood Pressure
6. weight
7. Residence of patients
8. Marital status
9. Level of education
10. Body mass Index
11. FBS (Fasting Blood Sugar)
12. Diabetic Complications

Statistical Analysis

Survival analysis a statistical analysis that used to describe the analysis of data in the form of a well-defined time origin until the occurrence of some particular event or end point. Generally, survival analysis is a collection of statistical procedures for data analysis for which the outcome variable of interest is time until an event occurs. If the end point is the death of a patient, the resulting data are literally survival times.

In this study the Cox proportional hazard model were use to examine survival time of diabetic patient. Kaplan-Meier estimators were applied to estimate survival curves of diabetic patient and the log rank test will use for the comparison between the variable categories. And with this understanding, we start our method by giving the definition of censoring, Kaplan-Meier and Cox proportional model; we then proceed to model building and assessments.

Censoring

Due to time period confinement, censoring and truncation are common in survival data analysis and need to take into considerations. A censored observation is one whose value is incomplete due to random factors for each subject. The most common form of censoring for incomplete data is **right censoring** when a subject's follow-up time terminates before the outcome of interest is observed. The second type of censoring is **left censoring** which is observed when an individual had developed the event of interest prior to the beginning of the study. An observation is categorized into an **interval censored** if it is only known that the event of interest occurs within an interval of time without the knowledge of when exactly it occurs. In this study by construction, we can have right censored data but not the others.

Kaplan-Meier Estimation

Kaplan-Meier Estimation is a product limit estimation of the survivorship function which is developed by Kaplan-Meier (1958). Kaplan-Meier (KM)estimator is used by most software packages because of the simplistic step approach. The KM estimator incorporates information from all of the observations available, both censored and uncensored, by considering any point in time as a series of steps defined by the observed survival and censored times. When there is no censoring, the estimator is simply the sample proportion of observations with event times greater than t. The technique becomes more complicated but still manageable when censored times are included. The KM estimator consists of the product of a number of conditional probabilities resulting in an estimated survival function in the form of a step function. It is a nonparametric estimator of the survivor function $S(t)$ [7].

Proportional Hazards Model

The basic model for survival data to be considered in this study is the proportional hazard model. This model was proposed by David Cox (1972) and has also come to be known as the Cox regression model. The model is also referred to as a semi-parametric model. Semi-parametric models are models that parametrically specify the functional relationship between the lifetime of an individual and his characteristics but leave the actual distribution of lifetimes arbitrary.

Results

Descriptive Statistics

There were 682 patients in the cohort study out of which 108 (15.8%) died and the remaining 574(84.2%) were censored. There were 407 females and 275 males. The proportion of deaths among females 12.3% is lower than males 21.1%. The proportion of death among healthy diabetic patient 60(10.2%) which is lower than those underweight 20(76.9%) and overweight 28(71.8%) patients. The proportion of death among normal blood pressure patient is 30(6.2%) which is lower than those high 34(26.0%) and uncontrollable 44(68.8%) blood pressure diabetic patient. The proportion of death among positive family history of diabetic patient is 60(35.9%) which is higher than those with negative family history of diabetic patient 48(9.5%). The proportion of death among type I diabetic patient is 76(40.6%) which higher than those type II diabetic patient 32(6.5%). The proportion of death among diabetic patient with no complication is 10(3.2%) which is lower than those diabetic patient with cardiac complication 25(29.8%), eye complication 26(29.5%), neurologic complication 30(25.9%) and patient with other type of complications17(25.4%).

The mean age of dead diabetic patient was 35.48 with minimum and maximum value 21 and 87 respectively. The mean weight of dead diabetic patient was 50 with maximum and minimum value 25 and 103 respectively. The mean fasting blood sugar of dead diabetic patient was 462.3 with minimum and maximum value 200 and 600 respectively.

The Chi-square test showed that survival status of a patient was significantly associated with sex, baseline body mass index, baseline blood pressure, family history of diabetes mellitus, type of diabetes mellitus and complications of diabetes mellitus (p-value<0.05) [Table 1].

Table1: Summary results of diabetes mellitus death events by different socio-demographicand health variables at Ottona and Tarcha Hospital during 2008-2016.

Variables	Number of death (%)	Number of Censored(%)	Total (%)	Chi-Square P-value
Sex				0.002*
Male	58(21.1)	217(78.9)	275(40.3)	
Female	50(12.3)	357(87.7)	407(59.7)	
Marital Status				0.344
Never married	16(19.8)	65(80.2)	81(12.0)	
Married	52(14.2)	315(85.8)	367(54.2)	
Divorce/ Windowed	40(17.5)	189(82.5)	229(33.8)	
Educational level				0.07
No education	26(13.3)	169(86.7)	195(29.1)	
Primary	22(12.4)	155(87.6)	177(26.4)	
Secondary and above	58(19.4)	241(80.6)	299(44.6)	
Residence				0.445
Urban	94(16.3)	483(83.7)	577(84.6)	
Rural	14(13.3)	91(86.7)	105(15.4)	
Employment Status				0.610
Employed	48(45.7)	270(48.0)	318(47.6)	
Unemployed	57(54.3)	289(51.3)	346(51.8)	
Body mass index				0.000*
Underweight	20(76.9)	6(23.1)	26(4.0)	
Healthy	60(10.2)	527(89.8)	587(90.0)	
Overweight	28(71.8)	11(28.2)	39(6.0)	
Blood Pressure				0.000*
Uncontrollable	44(68.8)	20(31.2)	64(9.4)	
High	34(26.0)	97(74.0)	131(19.2)	
Normal	30(6.2)	456(93.8)	486(71.4)	
Family History of DM				0.000*
Positive	60(35.9)	107(64.1)	167(24.9)	
Negative	48(9.5)	457(90.5)	505(75.1)	
DM Type				0.000*
Type I	76(40.6)	111(59.4)	187(27.4)	
Type II	32(6.5)	463(93.5)	495(72.6)	
Diabetic Complications				0.000*
Cardiac Complication	25(29.8)	59(70.2)	84(12.6)	
Neurologic complication	30(25.9)	86(74.1)	116(17.4)	
Eye Complication	26(29.5)	62(70.5)	88(13.2)	
Other	17(25.4)	50(74.6)	67(10.0)	
No complication	10(3.2)	302(96.8)	312(46.8)	

(*) The mean Survival time difference is significant at $\alpha=0.05$

Comparison of Survival time of diabetes mellitus patients

Above 50% of the observation are censored, comparison is made based on mean survival time. Females had higher survival compared with men. Results based on the given log-rank test in there is a significant difference between male and female with respect to survival time (p-value=0.009). Diabetic patient with healthy body mass index had higher survival time as compared with underweight and overweight patients is a significant difference between survival time of body mass index categories (p-value=0.000). Diabetic patient with normal blood pressure had higher survival time as compared with high and uncontrollable patients and patient with uncontrollable blood pressure had lower survival time than patient with high blood pressure.There is a significant difference between survival time of blood pressure categories (p-value=0.000) [Table 2].

Among different diabetic categories, type 1 DM patients had the lowest survival time than those type II diabetic patient and it was also statistically significant (p-value=0.000). The log-rank test for survival difference were also highly significant. Diabetic patient with positive family history diabetes mellitus had lowest survival time than diabetic patient with negative family history of diabetes mellitus. The log-rank test for survival difference were also highly significant (p-value=0.000). diabetic patient with neurologic complication had lowest survival time followed by cardiac complication, eye complication and other complication.There is a significant difference between survival time diabetic complication categories (p-value=0.000) [Table 4.2].

Multiple Covariates Analysis for survival time

After adjusting other covariates, the risk of death of male patient has been increased (adjusted HR= 2.029, 95% CI=1.27-3.23).The hazard ratio for fasting blood sugar was (adjusted HR=0.003, 95% CI=1.001-1.004). This indicates that a 10 unit (in mg/dl) increase in the amount of fasting blood sugar level would result in the estimated hazard ratio for the survival of diabetic patients to be exp (10 *.003) = 1.03. The estimated coefficient for the baseline weight being $\hat{}$ = -0.032 for continuous risk factor implies the hazard ratio was $\exp(\hat{}) = 0.969$. This indicates the change of hazard rates for every one unit (in kg) decrease in the weight of the patient (adjusted HR=0.969, 95% CI=0.947-0.991) which is baseline weight decreases the hazard time of the patients by 3.1%.

The risk of death for type II diabetic patient decreased by 70.1% than that of type I diabetic patient (adjusted HR=0.299, 95% CI=0.180-0.498). The risk of death among patients with positive family history of diabetic mellitus has been increased (adjusted HR= 1.745, 95% CI=1.076-2.831). The risk of death among high blood pressure patient was about 1.9 times than that of patient with normal blood pressure (adjusted HR=1.924, 95% CI=1.066-3.474) [Table 3].

Assessment of model adequacy for survival time

The time-dependent covariates (interaction of covariates with logarithm of time) were not significant which justifies the proportional hazard assumption holds at 5% level of significance. The plot of the scaled Schoenfeld residuals [SF, Figure 1] also shows that the residuals are random without any systematic pattern and the smoothed plot approximates a horizontal line. Thus, there is no violation of proportional hazards assumption [Table 4].

Finally, the results of the likelihood ratio test (chi-square=262.45, p-value < .000) and Score test (chi-square=432.48, p-value < .000) shows that the model fit is good, i.e. significant at 5% level of significance. Thus, from all results we can say that our model fits the data very well.

Table 2: Comparison of survival experience of Diabetic Mellitus patients for socio-demographic and health variable at Ottona and Tercha Referral Hospital during 2008-2016.

Variables	Mean survival time (in month)	95% CI for the Mean Survival time	Log-rank p-value
Sex			0.009*
Male	96.64	86.6-96.7	
Female	100.03	96.4-103.6	
Marital Status			0.754
Never married	93.75	85.0-102.5	
Married	96.5	91.9-100.9	
Divorce/ Windowed	94.2	89.5-98.8	
Educational level			0.052
No education	99.7	94.6-104.7	
Primary	96.4	91.6-101.2	
Secondary and above	92.3	87.4-97.2	
Residence			0.899
Urban	96.4	93.1-99.6	
Rural	86.3	80.6-91.9	
Employment Status			0.558
Employed	97.6	93.4-101.8	
Unemployed	95.6	91.6-100.0	
Body mass index			0.000*
Healthy	101.9	98.9-104.8	
Underweight	47.8	33.7-62.0	
Overweight	40.1	28.8-51.5	
Blood Pressure			0.000*
High	47.9	40.1-55.8	
Uncontrollable	88.1	81.6-94.6	
Normal	106.3	103.4-109.3	
Family History of DM			0.000*
Positive	67.2	61.0-73.3	
Negative	104.2	101.6-106.8	
DM Type			0.000*
Type I	71.82	65.6-71.9	
Type II	106.63	104.2-109.0	
Diabetic Complications			0.000*
Cardiac Complication	81.7	71.5-91.9	
Eye complication	79.2	71.1-87.4	
Neurologic complication	85.9	78.6-93.2	
Other	86.4	76.5-96.3	
No complication	109.7	106.8-112.6	

(*) The mean Survival time difference is significant at $\alpha=0.05$

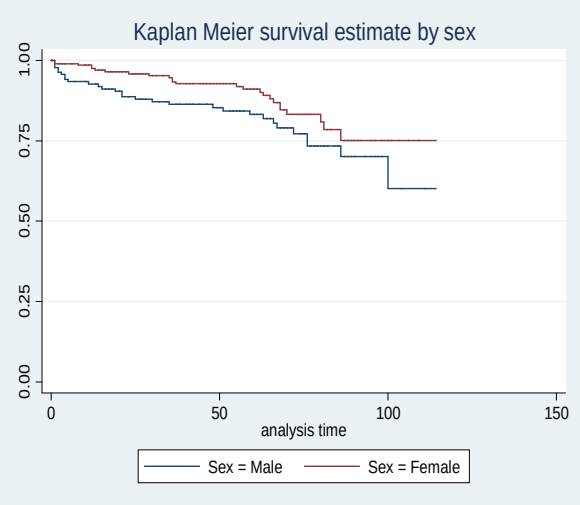
Table 3:Multiple Covariate Analysis for socio-demographic and health variables that affect survival time of diabetes mellitus patients at Ottona and Tarcha Referral Hospital during 2008-2016.

Variables	Category	Level of significant	Adjusted hazard ration	95% CI for HR
Sex	Male	0.003	2.029	1.27-3.23
	Female (reference)		1	
Fasting Blood sugar level		0.002	1.003	1.001-1.004
Weight		0.005	0.969	0.947-0.991
Diabetic Type diagnosed	Type II	0.000	0.299	0.180-0.498
	Type I (reference)		1	
Family History of diabetes mellitus	Positive	0.024	1.745	1.076-2.831
	Negative(reference)		1	
Blood Pressure	High	0.030	1.924	1.066-3.474
	Uncontrollable	0.000	3.619	2.021-6.481
	Normal(reference)		1	
Body mass index	healthy	0.000	0.206	0.114-0.371
	Under weight	0.142	0.596	0.299-1.188
	Over		1	
Diabetic complications	Cardiac complication	0.003	3.798	1.576-9.154
	Eye complication	0.027	2.641	1.114-6.261
	Neurologic	0.003	3.657	1.554-8.607
	Other	0.001	4.565	1.845-11.299
	None (reference)		1	

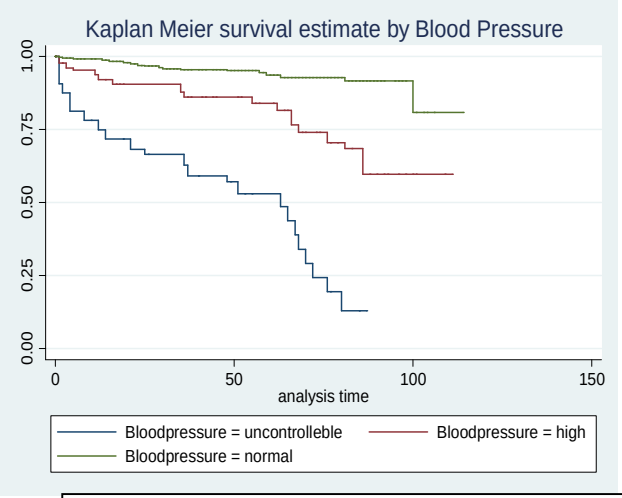
Table 4:Statistical test for Proportional hazards assumption of multiple covariates and their interaction with log of time for the survival time of diabetes mellitus patient at Ottona and Tarcha referral hospital during 2008-2016.

Characteristics	B	SE	Wald	Df	Sig.	Exp(B)	95.0% CI for Exp(B)	
							Lower	Upper
Sex	0.902	0.642	1.974	1	0.160	2.464	0.700	8.672
Blood pressure	-0.224	0.346	0.419	1	0.517	0.799	0.406	1.575
Family history of DM	-2.131	0.723	8.682	1	0.003	0.119	0.029	0.490
DM type	1.254	0.676	3.438	1	0.064	3.504	0.931	13.192
Body mass index	1.467	0.347	17.904	1	0.000	4.336	2.198	8.554
Weight1	-0.051	0.036	2.076	1	0.150	0.950	0.886	1.019
Diabetic complication	-0.407	0.230	3.126	1	0.077	0.665	0.424	1.045
Fasting blood sugar	0.002	0.001	11.435	1	0.001	1.002	1.001	1.003
Sex*ln(T)	-0.074	0.191	0.152	1	0.697	0.928	0.639	1.350
Blood pressure*ln(T)	-0.140	0.106	1.733	1	0.188	0.870	0.706	1.071
Family history of DM*ln(T)	0.114	0.196	0.340	1	0.560	1.121	0.763	1.646
DM type*ln(T)	-0.040	0.199	0.040	1	0.841	0.961	0.650	1.420
Body mass index*ln(T)	-0.189	0.110	2.935	1	0.087	0.828	0.667	1.028
Weight*ln(T)	0.005	0.011	0.261	1	0.609	1.005	0.985	1.027
Diabetic complication*ln(T)	0.070	0.068	1.058	1	0.304	1.072	0.939	1.225
Fasting blood sugar*ln(T)	-0.003	0.002	2.270	1	0.132	0.997	0.994	1.001

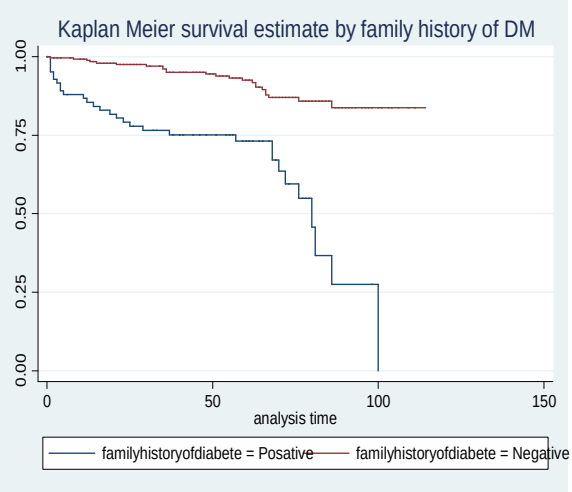
S1 figure 1: The Kaplan-meier survival function estimates for survival time of HIV patients.



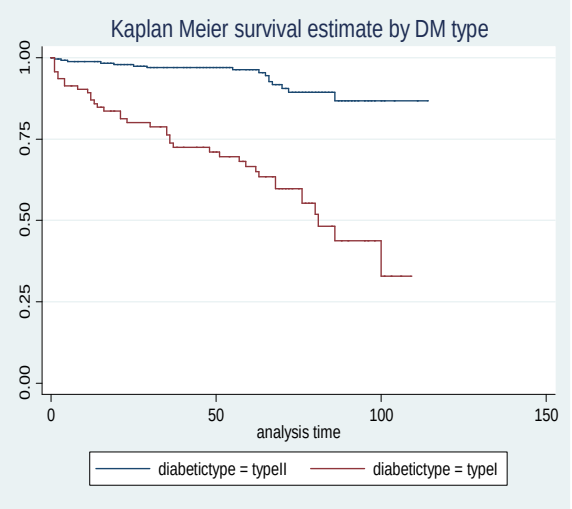
A) KM survival estimates for the variable sex.



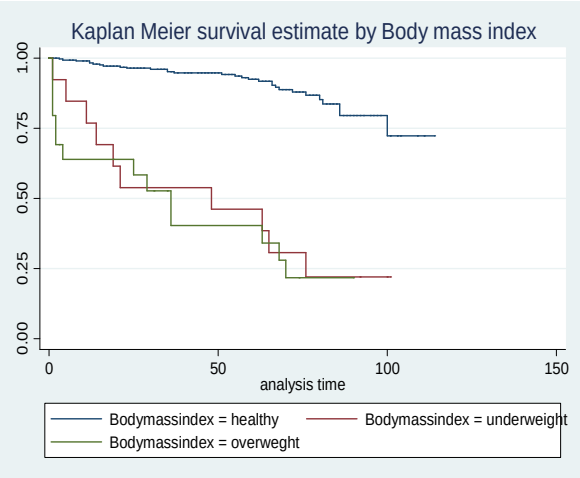
B) KM survival estimates for the variable Blood pressure.



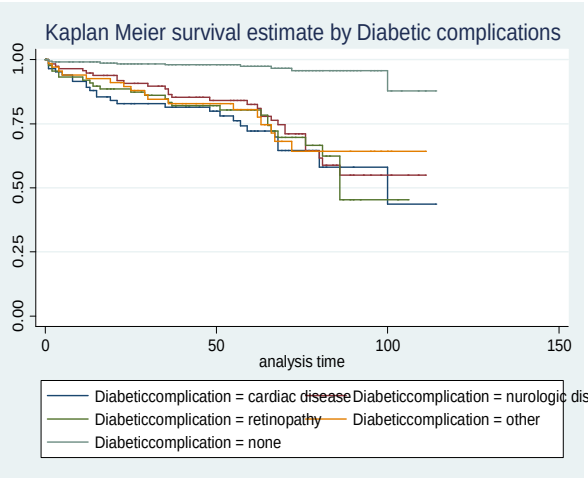
C) KM survival estimates for the variable family history of DM



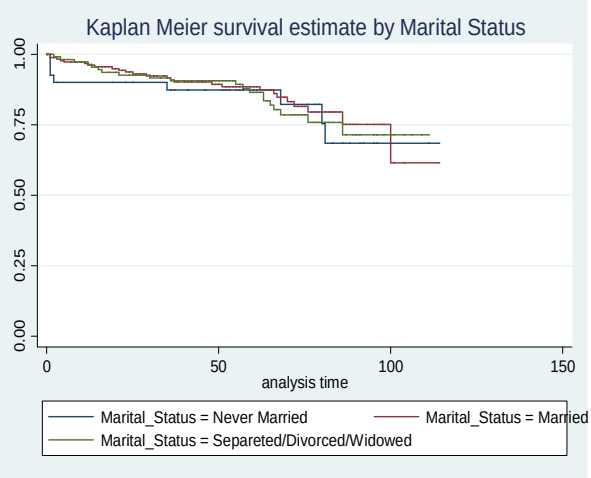
D) KM survival estimates for the variable DM type



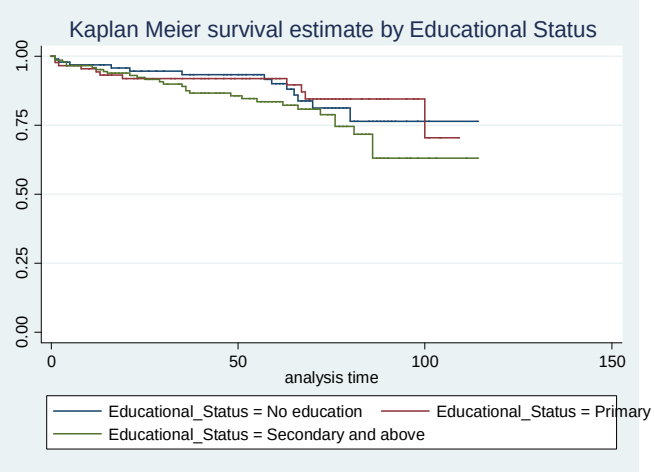
E) KM survival estimates for the variable Body mass index



F) KM survival estimates for the variable diabetic complications.



G) KM survival estimates for the variable Marital Status



H) KM survival estimates for the variable Educational Status

Discussion

This study identified variables/factors that are significantly associated with increased risk of mortality. Identifying patients at a higher risk of death has the advantage that due attention will be given to the risk group during their follow up to minimize the risk of mortality while they are taking the treatment.

The risk of death of male patient has been increased about 2 times than females. That is, male patients tended to die faster than the female patients. This result agrees with the result obtained from previous study where men had lower survival time compare to women [23]. This outcome is also in agreement with the study that was done in mililik II referral hospital,Australia and New Zealand in which they found out that sex was significantly associated with the quality of life of the diabetic patients where females tended to recover faster than males [18,22,25].

A 10 unit (in mg/dl) increase in the amount of fasting blood sugar level would result in the estimated hazard ratio for the survival of diabetic patients to be exp (10 *.003) = 1.03. This result is in agreement with the study that was done in Canada [26]. when they found out that the change of hazard rates for every one unit (in mg/dl) increase in the amount of fasting blood sugar level. baseline weight decreases the hazard time of the patients by 3.1%. This outcome is in agreement with a study done in Addis Ababawhere initial weight decreases the hazard time of the patients by 4.1%. This result is also in agreement with [20,26].

The risk of death for type II diabetic patient decreased by 70.1% than that of type I diabetic patient. This result in agreement with Addis Ababa showing that the types of diabetic disease diagnosed were also a prognostic factor that significantly predicts the survival time of diabetic patients[20]. Other study in Canada indicate that the survival time for type 1 population was shorter than type 2 populations [26].

The risk of death among high blood pressure patient was about 1.9 times than that of patient with normal blood pressure. Similarly, the risk of death among patient with uncontrollable blood pressure was 3.6 times than that of patient with a normal blood pressure. The finding is confirmed by the previous study, Addis Ababa and Northwest Ethiopia that hypertension is consistently and independently associated with the risk of morbidity and mortality from DM [20,21]. This result disagrees with the study in Uganda which is patients whose diastolic blood pressure was high had a longer survival [27].

The risk of death among patient with healthy body mass index decreased by 79.4% than that of overweight patient. This result is comparable with the study in Addis Ababa y which showed that the hazard rates of the obese (overweight) patients was much higher [20].

The risk of death among patient with cardiac complications was 3.8 times than that of patient with no complications. The risk of death among patient with eye complication was 2.6 times than that of patient with no complications. The risk of death among patient with neurologic complication was 3.657 times than that of patient with no complications. This result is comparable with the study in North Ethiopia and Malaysiathe finding illustrated that patient with diabetic complication was less likely to survive than patient with no complicatios [23,26].

Conclusion

The Cox regression analysis showed that the major factors that affect the survival of diabetic mellitus patients are sex, blood pressure, family history of diabetes mellitus, type of diabetes mellitus diagnosed, body mass index, baseline weight, diabetes mellitus complications and baseline fasting blood sugar. Males had lower survival time compared to women patients.patients with poor health indicators like being overweight, uncontrollable blood pressure, high blood pressure,diabetic complications, high amount of fasting blood sugar level, being type I and positive family history of diabetics, were less likely to survive.

The result of this study also indicated that survival probability of a patient is not statistically different among groups classified by age, place of residence, educational level, employment status and marital status.

Ethics approval and consent to participant

Ethical approval was obtained from Institutional Review Board of wolaitasodo University, and submitted to each Hospital. In addition, Permission was obtained to conduct the research from zonal health department and each hospitals administration. Document was reviewed with strict confidentiality of the document and any written data by excluding patient name.

Consent for publication

Not applicable.

Availability of data and materials

The data that support the findings of this study are available from the corresponding authors upon reasonable request.

Competing interests

The authors declare that they have no competing interests. All authors have read and approved the final manuscript.

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Author Contributions

Desalegn Dargaso, Bezalem Eshetu,and Eyasu Tamiru were involved in the conception, design, analysis, interpretation, report, and manuscript writing

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