

# Predictors of Health-Related Quality Of Life among Diabetic Patients Attending Primary Health Care Centers In Makkah, Saudi Arabia, 2019

Emad Almoalem\*, Rajaa Al-Raddadi

The Joint Program of Community and Preventive Medicine, Jeddah, Kingdom Of Saudi Arabia

## ABSTRACT

**Background:** People with diabetes face multiple factors that could influence their quality of life. In Saudi Arabia, limited study has been done with regard to assessing the quality of life of diabetic patients. Thus, this research aims to determine the quality of life (in relation to health) as well as its prevalence and predictors among people with diabetes in Makkah.

**Methodology:** A cross-sectional analytic type of research was done to type 2 diabetic patients (N=299) attending chronic disease clinics at PHCCs in Makah, Saudi Arabia. SF-36 survey was employed in determining the (health-related) quality of life of the 18 years old respondents, focusing on 8 domains such as physical functioning, role-physical, bodily pain, general health, vitality, social functioning, role-emotional and mental health. The score for each domain (converted to hundred points scale) was then compared with certain characteristics, utilizing various statistical tests.

**Results:** Result reveals that the highest SF-36 survey score was observed on bodily pain domain (Mean=67.02, SD=26.8) while lowest on role-emotional domain (Mean=28.43, SD=44.3). All domains were significantly associated across different age groups, having obvious significant decrease in scores as age decreases for the role-physical, bodily pain, social-functioning and role-emotional domains. Pearson correlation analysis shows that all domains exhibit significant negative correlation with age, suggesting that with increasing age of the participants, the (health-related) quality of life decreases. Overall, age was identified as the major significant risk factors among 7 out of 8 SF-36 domains.

**Conclusion:** SF-36 survey result shows that diabetes has big effect on the (health-related) quality of life at different domains. In general, age is considered as the most significant risk factor affecting majority of all domains. This suggests that it must be a priority factor to consider when executing care intervention in relation to improving the quality of life among diabetic patients.

**Keywords:** Diabetic; Health Care; Diabetes Mellitus; Hypertension

**Abbreviations:** WHO: World Health Organization; IDF: International Diabetic Federation; HRQOL: Health Related Quality Of Life

## INTRODUCTION

### Background

As of 2014, diabetes mellitus was considered one of the primary causes of morbidity, with roughly 422 million individuals being affected by the disease worldwide. This number is likely to rise continually, with the World Health Organization (WHO) and International Diabetic Federation (IDF) estimating that this would only continue to grow in the upcoming years [1]. In Saudi Arabia, 23.9% of the total population [2] suffers from diabetes mellitus. The IDF ranks Saudi Arabia as included in top ten countries afflicted with diabetes mellitus. The management of a diabetes-

affected patient incurs the country a massive cost of an estimated 17 billion riyals. This number will increase to 27 billion riyals when undiagnosed cases are included. Moreover, the number is approximately 13.9% of the total health costs in the country [3]

Referring to as a set of metabolic diseases, diabetes mellitus is described by an increase in blood glucose level. This phenomenon is due to insulin secretion defects, action or both [4]. The chronic hyperglycemia of diabetes is known to have association with lasting impairment, malfunction and failure of several organs, more importantly the eyes, heart, blood vessels, nerves as well as kidneys. The said disorder performs vital part in the "quality life" aspect of the patients as it affects their physical and mental health [5]. The

\*Correspondence to: Emad Almoalem, the Joint Program of Community & Preventive Medicine, Jeddah, Kingdom Of Saudi Arabia

Received: April 021, 2021; Accepted: April 17, 2021; Published: April 02, 2021

Citation: Almoalem E, Al-Raddadi R, (2021) Predictors of Health-Related Quality Of Life among Diabetic Patients Attending Primary Health Care Centers In Makkah, Saudi Arabia, 2019. J Clin Med Sci. 5:171.

Copyright: © Almoalem E, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

poor control of blood glucose is related with higher risk of devolving diabetic complications, microvascular and macrovascular, which generally prove to be life threatening [6].

The Health-Related Quality Of Life (HRQOL) includes the physical, psychological, and social aspects of the patients. The HRQOL of a person is affected when he or she is diagnosed with diabetes mellitus. Moreover, a study linked diabetes mellitus with the factors responsible for lowering the quality of life among persons who are diagnosed with it in comparison to healthy persons. Additionally, it attempted to understand the factor that affects the quality of life of a diabetic patient, thereby aiding the healthcare provider to manage the disease effectively [7].

Patients with diabetes face multiple aspects which could affect their quality of life, including low physical activity, increased weight, co-morbid diseases (hypertension, heart diseases, and hypercholesterolemia) and all their complications. This research aims to gauge the quality of life related to health as well as its prevalence and predictors patients with diabetes in Makkah.

### Rationale

Diabetes mellitus belongs to the top significant health concerns in Saudi Arabia, affecting the health as well as other aspects of the lives of those who were unfortunately diagnosed with the said disease. In Saudi Arabia, no study has previously been done specifically in Makkah City with regard to assessing the quality of life of individuals having “type 2” classification of diabetes. Hence, analyzing the factors affecting the quality of life of these people could be very helpful in proper understanding of which components of their lives have been significantly affected, thereby allowing the health authorities to execute proper intervention.

### Aim

This research targets to investigate the factors affecting the quality of life of persons having diabetes mellitus.

### Objectives

- To estimate the quality of life in relation to health in adults with type 2 diabetes mellitus at the primary care center in Makkah, 2019.
- To identify the factors related to HRQOL in people with diabetes at the primary care center in Makkah, 2019.

## LITERATURE REVIEW

In a study conducted by Redekop and others [8], the HRQOL together with treatment satisfaction among 1348 Dutch type 2 diabetic patients were estimated. The patient characteristics were examined to determine which are associated with HRQOL and satisfaction from treatment. The Cost of Diabetes in Europe (CODE-2) was utilized in order to provide an inclusive assessment on costs and HRQOL whereas the Diabetes Treatment Satisfaction Questionnaire was utilized to determine treatment satisfaction. In this study, different factors such age and sex, together with the presence of insulin therapy, complications as well as obesity were found to be associated with significantly different HRQOL. However, there is low association between treatment satisfaction and HRQOL.

Two hundred and twenty-nine (229) type 2 diabetic patients were evaluated when it comes to HRQOL and significant indicators of the disease were identified. SF-36 instrument was utilized to evaluate HRQOL and statistical tools, such as non-parametric

Mann-Whitney and Kruskal-Wallis tests, were utilized in comparing the scale scores. The effect of sociodemographic and diabetes-related factors on HRQOL were investigated by employing multivariate stepwise linear regression. Results showed that significant difference in HRQOL was correlated with gender, complications with diabetes, presence of other diseases and longer duration of diabetes. Likewise, multivariate regression analyses revealed that indicators related to diabetes are more important disease predictors rather than sociodemographic factors[9].

A 2013 evaluation of HRQOL of 214 teenagers with type 1 diabetes was conducted using cross-sectional type of study in Riyadh, Kingdom of Saudi Arabia (KSA). The participants were examined using the Arabic version of Pediatric Quality of Life Inventory 3.0 Diabetes Module (PedsQL 3.0 DM). Several factors were correlated with low HRQOL such as gender, multiple injections on a daily basis, greater than 7 years of diabetes, diabetic ketoacidosis, and higher than 7 HbA1c level [10].

Four hundred adult diabetic patients of more than 1 year and present at a diabetes center in Riyadh, KSA were assessed in terms of QOL and potential risk factors were determined and correlated with QOL. Sociodemographic variables such as age of patient, education, and occupation do not influence the QOL of patients, whereas females were found to have lower QOL scores than male participants. Although there is no association with duration of diabetes and QOL, adults with more than 20 years of diabetes were deemed to have lower QOL scores. Disease characteristics that were found to have high association to lower QOL are those with uncontrolled diabetes and patients having type 2 diabetes [11].

Another study was conducted to evaluate HRQOL together with the risk variables affecting type 2 diabetic patients in Al-Khobar, KSA. About 432 participants, which comprise of 216 patients with diabetes and 216 control patients, were surveyed using an Arabic version of SF-12 questionnaire. Result showed that lower socioeconomic standing, educational attainment, as well as higher levels of obesity were common in majority of the patients. In addition, HRQOL was found to lower for type 2 diabetic patients, particularly for those with uncontrolled diabetes [11].

Another evaluation of HRQOL among type 2 diabetic patients was done in separate hospital in Riyadh, KSA. EuroQoL-5 Dimension (EQ-5D) measure was utilized in the assessing 75 patients. Majority of the respondents were males with about 13-year history of diabetes. No substantial correlation was found between HRQOL and age, educational attainment, marital status, type of treatment, and duration of diabetes. However, HRQOL was lower in female patients in comparison to male ones [12].

Abolfotouh and others [13] conducted a cross-sectional survey among 420 diabetic outpatients of King Abdulaziz Medical Center, KSA to evaluate their QOL and glycemic control. Diabetes QOL Brief Clinical Inventory, which was translated into Arabic, was utilized in this study and personal, disease, and lifestyle characteristics of each participant was determined. Although an average QOL was reported, lifestyle and disease characteristics such as worry of having physical illness, bad sleep, treatment pains, and career limitations because of diabetes were reported by the respondents. Higher QOL scores were reported for male gender, treatment with oral pills, healthy diet, physical inactivity, and absence of diabetic complications. However, poor glycemic control was recorded in about two-thirds of the patients surveyed. This study found out that poor glycemic control can be significantly

predicted by presence of diabetic complications.

On the other hand, HRQOL and impact of disease on family was measured amongst Saudi adolescents who suffers from type 1 diabetes mellitus. About 315 adolescent patients with age ranging from 12 to 18 years old participant in this cross-sectional study. Peds QL Diabetes Module 3.0 was utilized to measure HRQOL among patients and parents, whereas Peds QL Family Impact Module was used to determine the disease influence on the family. Results showed that adolescent patients had an average HRQOL score of 64.6, whereas parents reported an average score of 60.3, which is lower as compared to that of adolescent patients. Lower HRQOL were reported for female patients and those of late adolescent age. Meanwhile, family impact scores by parents of adolescent patients were reported to be highest in 'family relationships' scale and lowest in 'worry' and 'emotional functioning' scales.

A brief type of the Diabetes Quality Of Life questionnaire (DQOL) was utilized in evaluating 200 diabetic Omani respondents. Different parameters such as sociodemographic factors, Body Mass Index (BMI), and clinical parameters deemed necessary in diabetes diagnosis were considered. Results revealed that better DQOL and higher glycemic control satisfaction score was better for participants who suffered for <5 years and glycated Hemoglobin A1c level (HbA1c) of lower than 8%. In addition, better quality of life was reported for participants of less than 40 years of age in comparison to other age clusters [14].

Likewise, the Diabetes Quality of Life was used to examine 376 type 2 diabetic Turkish patients, together with their sociodemographic and diabetes-related clinic characteristics. As such, results showed that diabetes performed a vital part in the HRQOL of patients included in the study. Factors like age, gender, marriage, education, family status, and history of diabetes sparked valuable variations in DQOL. Diabetes-related factors such as suffering from disease for less than 5 years, absence of complications or no history of prior hospitalization, having received insulin, and HbA1c level of less than 7 were also reported to have better overall DQOL. Lastly, higher levels of diabetes satisfaction were noted for patients with BMI of lower than 24 as compared to those with BMI of greater than 24 [15].

D'Souza and others explored the significant indicators of HRQOL among Omani respondents with type 2 diabetes. Three hundred participants took part and questionnaire tools, such as Euro-QoL and Revised Summary of Diabetes Self-Care Activities, were utilized in this research. Quality of life determinants such as such as schooling, positive self-management, age, prevention of certain daily activities, and disease knowledge were deemed noteworthy among women in comparison to men. Personal and clinical characteristics were accounted to explain about 30.6% and 35.7% of the variance in total QOL for women and men, whereas 14% and 23% of the variance in health state was attributed to Omani women and men, respectively.

In a study conducted by Misra and Lager [16], a path study was utilized among 180 type 2 diabetic adult patients to investigate the correlation of various psychosocial factors such as social support and disease acceptance, disease knowledge, apparent struggles in self-care behaviors, and disease consequence. Results showed that higher level of social support could indicate an increment of acceptance and reduced self-care behaviors. In addition, high levels of acceptance were displayed by the respondents. Self-care behaviors played a valuable role in influencing HRQOL as well

as mediating the correlation between QOL, social support, and acceptance.

Lastly, 200 type 2 diabetic patients were studied in Estonia and the substantial predictors of their QOL were determined. The respondents completed a SF-36 together with a questionnaire of their apparent disease awareness. This study showed that QOL was highly influenced by disease complication and risk factor awareness, together with age, disease duration, and patient's BMI. Hence, the main challenges dealt by medical doctors, in terms of type 2 diabetes management, are patient awareness as well as modifying the BMI of patients [17].

## METHODOLOGY

### Study design

Cross-sectional analytic study

### Study area

The research was done in selected 85 primary health care centers, operated by the Ministry of Health, in Makkah City. Study Population

The population includes type 2-diabetic patients attending chronic disease clinics at Primary Health Care Centers (PHCCs) under the Ministry of Health in Makkah City.

### Eligibility Criteria

Diabetic patients above 18 years of age

### Sample Size

Using Raosoft calculator, sample size was set as 299 under the assumption of 95% confidence level, 5.38% margin of error, 20000 population size and hypothesis of 60.3 overall score for the health-related quality of life of diabetic patients [5].

### Sampling Technique

The multistage sample technique was adopted. In the first stage, two centers from each sector were selected randomly. In the second stage, all patients attending the centers during the data collection dates were accounted as part of research work.

### Data Collection Tool

The 36-Item Short Form survey (SF-36 questionnaire) in Arabic version was given distributed to the participants to evaluate their quality of life when it comes to health, focusing on 8 domains which include physical functioning, role-physical, bodily pain, general health, vitality, social functioning, role-emotional and mental health. These domains were compared to the predictors after employing additive method and converting the score to a hundred points scale.

### Data collection tool validation

The SF-36 questionnaire used in the study were initially translated into Arabic and validated on a sample of 415 participants at Saudi ARAMCO Company, Dhahran, Saudi Arabia. Internal consistency, equivalent-forms, and test-retest reliability were estimated for the Arabic and English versions of the survey. The study proves the reliability and equivalence of both versions [18].

### Study Variables

In this study, the independent variables include gender, age, sex, duration of diabetes, presence of comorbidities, control of diabetes,

smoking and exercise. The dependent variables were the HRQOL using SF-36 survey score.

### Data Collection Technique

The questionnaire was filled out upon the interview of the researcher to the participants who satisfy the inclusion criteria, allowing clarification of any questions and completion of all questionnaires with the same standard. The data was verified by hand, then coded and entered to a personal computer.

### Data Entry and Analysis

The data was evaluated using IBM SPSS version 23, (IBM Corp., Armonk, NY). Simple descriptive statistics was employed in defining the characteristics of the study variables. Categorical and nominal variables were described through form of counts and percentages while continuous variables were presented as mean and standard deviations.

Using the standard formula and scoring system of RAND SF-36 survey, this study identifies the mentioned 8 domains. Specifically, all questions are scored on a 0 to 100 scale, representing 100 as the highest level of functioning possible. Accumulated scores were gathered in terms of percentage of the total points possible by following the RAND scoring table STEP I chart. The average scores from the questions concerning each specific area of functional health status (refer to STEP II chart) were then obtained, resulting to a final score for each of the 8 domains (e.g. physical functioning, general health etc.). After obtaining the average scores in terms of hundred points scale, the 8 domains were compared to the predictors.

Assuming a normal distribution, independent t-test and One-way ANOVA, with Least Significant Difference (LSD) as a post hoc test were utilized for the comparison of two group means and more than two groups. Otherwise, Welch's t-test for two group means and Games Howell for multiple groups were employed as a substitute for the LSD test. To correlate variables which both represented by means a Pearson's correlation coefficient was used. Also General Linear Regression Model (GLRM) was used to identify significant

predictors using a Main Effect model. Lastly, a conventional p-value <0.05 was set as the measure in rejecting null hypothesis.

### Pilot Study

Ten percent of the sample size was selected for the pilot study to check the feasibility of the data collection tools.

### Ethical considerations

This study was allowed to be done with permission from the Saudi Board of Community Medicine Research Committee and research ethics committee. Consent of the participants was considered an essential prerequisite for enrollment in the study. Confidentiality in the responses of the participants was ensured by keeping the collected data secured and used only for the purpose of the study.

### Study Limitations

Generalization of the findings (for the whole country) cannot be done since it only involves small sample size from a hospital-based study. However, the results can give preliminary information in terms of current health-related quality of life of diabetic patients.

### Budget

The research is self-funded.

## RESULTS

### Socio-demographic characteristics

In this cross-sectional analytic study, 299 diabetic patients were selected and were found to have an average age, height, weight, BMI and waist circumference of 51 years old (SD=10.7), 171 cm (SD=9.2), 82 kg (SD=10.7), 28 (SD=4.1) and 87 cm (SD=9.8) as shown in Table 1. Specifically, about one-third of them belongs to 40-50 years (31.4%) and 51-60 years (29.8%) age range, and more than one-third were classified as overweight (39.1%) and obese (38.5%). Other socio-demographic characteristics were also assessed in which majority of them were reported to be in married status. More than one-third attained high school (45.2%) and bachelor (44.5%) level of education (Table 1).

**Table 1:** Anthropometric and socio-demographic characteristics of the studied population (N=299).

Characteristics		Mean	SD
Age, years		50.94	10.7
Height, cm		171.19	9.2
Weight, kg		82.14	10.7
BMI		28.18	4.1
Waist Circumference, cm		87.49	9.8
		Count	%
Age (Years)	≥ 40	52	17.4
	40-50	94	31.4
	51-60	89	29.8
	> 60	64	21.4
Gender	Male	173	57.9
	Female	126	42.1
BMI	Normal weight	67	22.4
	Overweight	117	39.1
	Obese	115	38.5
Marital status	Married	279	93.3
	Single	6	2
	Divorced	14	4.7
Educational level	Elementary	5	1.7
	Intermediate	24	8
	High school	135	45.2
	Bachelor	133	44.5
	Master	2	0.7
Educational level	Intermediate and below	29	9.7
	High school	135	45.2
	Bachelor and Master	135	45.2

With regard to disease-related characteristics, the participants had an average 9.76 (SD=5.5) and 9.58 (SD=4.5) years of having diabetes and hypertension (Table 2). Specifically, one-fourth (24.7%) had diabetes for less than 5 years while roughly one-third had it for 5-10 years. Majority (54.2%) was found to be hypertensive wherein more than one-third had it for 6-10 years. For the female respondents, the mean number of their respective pregnancies and delivery were 4 (SD=2.1) and 3 (SD=2.0), and roughly three-fourth (77.8%) had no experience of miscarriage. Also, no one reported that they had stroke, diabetic foot, eye problem, diagnosed cancer, kidney disease and psychiatric disorders. And one-hundred twenty-six (n=126) participants had no gestational diabetes (Table 2).

For the smoking characteristics, majority were not utilizing cigarette, hookah and shisha as means to smoke. However, those who were smoking were already using cigarette, hookah and shisha for 26 (SD=8.5), 7 (SD=3.3) and 27 (SD=6) years (Table 3).

In terms of physical health-related activities, most of them considered their general health to be of good status (70.5%) which they considered to be about the same compared to previous year (99.3%) as shown in Table 4. Nearly half (45.0%) performed limited a lot vigorous activities, while majority (69.2%) were not under moderate activities (not limited at all). Nearly three-fourth (72.2%) was not lifting or carrying groceries, and roughly 60% (59.9%) were not bending, kneeling or stooping. Around 40% of

the respondents were climbing (limited a little) one flight of stairs (43.8%), however not (not limited at all) climbing several flights of stairs (42.1%). Also, about 45% were walking one (45.6%) and several blocks (47.8%), however not walking more than a mile (42.8%) (Table 4).

Table 5 shows the role-physical-related characteristics of the patients. Most of them reported to have no any problem with reducing their working hours (64.2%), with accomplished work less than they would like (59.9%) and with having limitation in the type of work or other undertakings (49.5%) during the past 4 weeks. Only 1% difference was observed for respondents who had (50.5%) and who did not have (49.5%) hard time executing the work or other activities for 4 weeks duration. On the other hand, about three-fourth of them reduced their load in job and additional undertakings (73.9%), accomplished not more than they would like (70.2%) and did not perform job and additional undertakings as carefully as typical (70.6%) as result of any emotional problems for the recent 4 weeks (Table 5).

The bodily pain-related characteristics of the participants were also described in this study (Table 6). Roughly one-fourth of them considered their physical health or emotional problems to not hinder at all with their normal social activities (24.4%) had a mild bodily pain (26.1%) and had a little bit pain interfered with their normal work (25.4%) during the past 4 weeks (Table 6).

**Table 2:** Diseases-related characteristics of the studied population.

Variables	N	Min	Max	Mean	SD
Years of having diabetes	299	2	26	9.76	5.5
Years of hypertension	161	1	21	9.58	4.5
Number of pregnancy	126	0	8	3.88	2.1
Number of Delivery	126	0	8	3.44	2
		Count		%	
Years of having diabetes	< 5	74		24.7	
	10-May	96		32.1	
	15-Nov	61		20.4	
	> 15	68		22.7	
Having hypertension	Yes	162		54.2	
	No	137		45.8	
Years of hypertension n=162	≤ 5	36		22.4	
	10-Jun	63		39.1	
	15-Nov	37		23	
	> 15	25		15.5	
Miscarriage n=126	Yes	28		22.2	
	No	98		77.8	
Gestational diabetes n=126	No	126		100	
Psychiatric disorders	No	299		100	

**Table 3:** Smoking characteristics of the studied population.

Variables	N	Min	Max	Mean	SD	No
Duration of cigarette smoking in years	67	13	49	26.39	8.5	No
Duration of hookah smoking in years	26	4	15	6.88	3.3	No
Duration of shisha smoking in years	14	16	39	27.43	6	No
		Count		%		
Total		299		100		
Smoking	Yes	101		33.8		
	No	198		66.2		
Cigarette smoking	Yes	67		22.4		
	No	232		77.6		
Hookah smoking	Yes	26		8.7		
	No	273		91.3		
Shisha smoking	Yes	14		4.7		
	No	285		95.3		

**Table 4:** Physical health-related activities of the studied population (N=299).

Variables	Count	%
Total	299	100
General health	Very good	1.7
	Good	70.5
	Fair	24.5
	Poor	3.4
	Missing	1
General health compared to previous year	Somewhat better now than one year ago	0.7
	About the same	99.3

Vigorous activities	Yes, limited a lot	134	45
	Yes, limited a little	86	28.9
	No, not limited at all	78	26.2
	Missing	1	
Moderate activities	Yes, limited a lot	47	15.7
	Yes, limited a little	45	15.1
	No, not limited at all	207	69.2
Lifting or Carrying Groceries	Yes, limited a lot	57	19.1
	Yes, limited a little	26	8.7
	No, not limited at all	216	72.2
Climbing several flights of stairs	Yes, limited a lot	77	25.8
	Yes, limited a little	96	32.1
	No, not limited at all	126	42.1
Climbing one flight of stairs	Yes, limited a lot	58	19.4
	Yes, limited a little	131	43.8
	No, not limited at all	110	36.8
Bending Kneeling or Stooping	Yes, limited a lot	46	15.4
	Yes, limited a little	74	24.7
	No, not limited at all	179	59.9
Walking more than a mile	Yes, limited a lot	61	20.4
	Yes, limited a little	110	36.8
	No, not limited at all	128	42.8
Walking several blocks	Yes, limited a lot	58	19.4
	Yes, limited a little	143	47.8
	No, not limited at all	98	32.8
Walking one block	Yes, limited a lot	45	15.1
	Yes, limited a little	136	45.6
	No, not limited at all	117	39.3
Bathing or dressing Yourself	Missing	1	
	No, not limited at all	299	100

**Table 5:** Role-physical-related characteristics of the studied population (N=299).

Variables		Count	%
Total		299	100
During the past 4 weeks did you have any problem with your work on cutting down in the amount of time you spent on work	Yes	107	35.8
	No	192	64.2
During the past 4 weeks did you have any problem with your work on accomplished less than you would like	Yes	120	40.1
	No	179	59.9
During the past 4 weeks did you have any problem with your work on Were limited in the kind of work or other activities	Yes	127	42.5
	No	172	57.5
During the past 4 weeks did you have Had difficulty performing the work or other activities	Yes	151	50.5
	No	148	49.5
During the past 4 weeks do you Cut down the amount of time you spent on work or other activities as a result of any emotional problems	Yes	221	73.9
	No	78	26.1
During the past 4 weeks do you Accomplished less than you would like as result of any emotional problems	Yes	210	70.2
	No	89	29.8
During the past 4 weeks you Didn't do work or other activities as carefully as usual as result of any emotional problems	Yes	211	70.6
	No	88	29.4

**Table 6:** Bodily-pain-related characteristics of the studied population (N=299).

Variables	Count	%
Total	299	100
During the past 4 weeks to what extent has your physical health or emotional problems interfered with your normal social activities	Not at all	24.4
	Slightly	15.4
	Moderately	31.4
	Quite a bit	17.7
	Extremely	11
How much bodily pain have you had during the past 4 weeks	None	44.1
	Very mild	7.4
	Mild	26.1
	Moderate	21.7
During the past 4 weeks, how much did pain interfere with your normal work	Severe	0.7
	Not at all	29.1
	A little bit	25.4
	Moderately	31.8
	Quite a bit	2.7
	Extremely	11

For the vitality-related characteristics, nearly and more than 40% had a “good bit of the time” feeling full of pep (46.8%), felt so unhappy in the dumps that not anything can uplift them (44.3%), had a lot of energy (42.8%), felt downhearted and blue (46.2%), felt worn out (39.8%) and had been a happy person (40.5%) for the past 4 weeks (Table 7). With regard to social functioning characteristics, more than 40% was also observed for those who had some of the time experienced their physical health or emotional problems to hinder with their social activities. Also, around one-third had a little bit nice time having been a very nervous person (32.4%) and feeling so tired (34.4%) (Table 7).

As shown in Table 8, the result of self-general health description and expectation of the respondents shows that majority did not know if they seem to get sick easily compared to other persons (57.2%) as well as if they anticipate their health to get worse (61.2%). More than one-third did not know (36.5%) and considered mostly false (37.5%) the idea of being healthy as anybody that they know. However, roughly two-third (65.2%) described their health as excellent (Table 8).

### SF-36 Survey Scores

The quality of life in relation to health of the participants was gauged utilizing the SF-36 questionnaire in this study. After converting the score to a hundred point scale, the participants averagely scored more than half on bodily pain (Mean=67.02, SD=26.8), physical functioning (Mean=66.24, SD=30.1), role-physical (Mean=57.78) and social functioning (Mean=55.69, SD=23.2) as indicated in Table 9. These were followed by mean scores of 48.86 (SD=7.9) on vitality, 48.65 (SD=10.7) on general health, 48.32 (SD=5.7) on mental health and 28.43 (SD=44.3) on role-emotional domains (Table 9).

### Association of SF-36 Survey Domains with different Factors

The relatively high standard deviation of SF-36 survey mean scores per domain assumes a not normal distribution toward age as a whole, making it more statistically acceptable to assess the scores across different age brackets of the respondents. Specifically, the SF-36 scores per domain were assessed across different age bracket. As shown in Table 10, physical functioning scores decreases significantly as age of the participants decreases. The 98.65 score

(SD=3.7) for 40 years and below age group dropped to 17.34 score (SD=12.1) as the age bracket becomes more than 60 years. Obvious significant decreasing score trend was also observed for the role-physical, bodily pain, social-functioning and role-emotional domains. On the other hand, a slight decrease (in general) was seen for other domains such as general health, vitality and mental health (Table 10).

All of the significant scores per domain indicated in Table 10 were further subjected to Games-Howell test to assess the mean difference across age groups (Table 11). Results show no significant physical functioning mean difference between 40 years old & below and 40-50 years age group ( $p=0.541$ ), between 40-50 years old and 51-60 years age group ( $p=0.108$ ), between 51-60 years old and 40-50 years age group ( $p=0.108$ ), between 51-60 years old and more than 60 years age group ( $p=0.095$ ) and between more than 60 years old and 51-60 years age bracket ( $p=0.095$ ). All other mean difference across different age groups not mentioned under physical functioning domain showed significant mean differences. For the domain, vitality, only the mean score difference between 40 years & below and more than 60 years, between 51-60 years old and more than 60 years and vice versa showed significance at  $p<0.001$  when compared with each other. All other comparisons exhibited no significant vitality score mean differences ( $p>0.05$ ). On the other hand, all age groups were found to show significant mean differences under the domain, social functioning ( $p\leq 0.001$ ). Similar observation was observed for the role-emotional domain except for the result of comparison between 51-60% years old and more than 60 years old age groups and vice versa ( $p=0.024$ ). In terms of mental health, there was a significant mean score differences ( $p<0.001$ ) when 40 years & below bracket was compared with 40-60 years old age group and vice versa (Table 11).

The multiple comparison analysis of SF-36 survey domains scores between male and female participants was also studied using Welch's t-test (Table 12). Results show that only bodily pain and general health domains exhibited significant association with gender at  $p<0.05$ , suggesting that all participants have high (health-related) quality of life however only these two domains showed significant association towards the gender factor. Also, female participants had higher scores compared to male in general (Table 12).

Table 7: Vitality-related characteristics of the studied population (N=299).

Variables	Count	%	
Total	299	100	
How much of the time during the past 4 weeks did you feel full of pep	Most of the time	41	13.7
	A good bit of the time	140	46.8
	Some of the time	63	21.1
	A little of the time	23	7.7
	None of the time	32	10.7
How much of the time during the past 4 weeks have you been a very nervous person	All of the time	20	6.7
	Most of the time	64	21.4
	A good bit of the time	97	32.4
	Some of the time	47	15.7
How much of the time during the past 4 weeks have you felt so down in the dumps that nothing could cheer you up	A little of the time	71	23.7
	All of the time	19	6.4
	Most of the time	70	23.5
	A good bit of the time	132	44.3
	Some of the time	49	16.4
How much of the time during the past 4 weeks did you felt calm and peaceful?	A little of the time	28	9.4
	Missing	1	
	All of the time	29	9.7
	Most of the time	54	18.1
	A good bit of the time	115	38.5
How much of the time during the past 4 weeks did you have a lot of energy	Some of the time	78	26.1
	A little of the time	23	7.7
	All of the time	20	6.7
	Most of the time	49	16.4
How much of the time during the past 4 weeks did you have a lot of energy	A good bit of the time	128	42.8
	Some of the time	79	26.4
	A little of the time	23	7.7
	All of the time	20	6.7
How much of the time during the past 4 weeks have you felt downhearted and blue	Most of the time	47	15.7
	A good bit of the time	138	46.2
	Some of the time	71	23.7
	A little of the time	23	7.7
How much of the time during the past 4 weeks did you feel worn out	All of the time	20	6.7
	Most of the time	51	17.1
	A good bit of the time	119	39.8
	Some of the time	86	28.8
How much of the time during the past 4 weeks did you feel tired	A little of the time	23	7.7
	All of the time	20	6.7
	Most of the time	43	14.4
	A good bit of the time	121	40.5
How much of the time during the past 4 weeks have you been a happy person	Some of the time	76	25.4
	A little of the time	39	13
	All of the time	20	6.7
	Most of the time	47	15.7
How much of the time during the past 4 weeks did you feel tired	A good bit of the time	103	34.4
	Some of the time	81	27.1
	A little of the time	47	15.7
	None of the time	1	0.3
	All of the time	20	6.7
During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities	Most of the time	46	15.4
	Some of the time	123	41.1
	A little of the time	71	23.7
	None of the time	39	13

**Table 8:** Self-general health description and expectation of the studied population (N=299).

Variables	Count	%
Total	299	100
I seem to get sick a little easier than other people	Definitely true	7
	Mostly true	14.4
	Don't know	57.2
	Mostly false	6.7
	Definitely false	14.7
I am as healthy as anybody I know	Mostly true	14
	Don't know	36.5
	Mostly false	37.5
	Definitely false	12
I expect my health to get worse	Definitely true	12
	Mostly true	26.8
	Don't know	61.2
My health is excellent	Mostly true	65.2
	Don't know	34.8

**Table 9:** Average scores per domain of the studied population based on SF-36 survey (N=299).

Domains	Min	Max	Mean	SD
Physical functioning	10	100	66.24	30.1
Role-physical	0	100	57.78	46.3
Bodily pain	0	100	67.02	26.8
General health	20	62	48.65	10.7
Vitality	25	65	48.86	7.9
Social functioning	0	100	55.69	23.2
Role-emotional	0	100	28.43	44.3
Mental health	32	64	48.32	5.7

**Table 10:** Average SF-36 survey scores per domain across different age groups of the studied population (N=299). a: Significant using One-Way ANOVA Test @<0.05 level.

Variables	Total	Age				P-value
		40 years and below	40-50 years	51-60 years	More than 60 years	
Total	299	52	94	89	64	-
Physical Functioning	66.24 ± 30.1	98.65 ± 3.7	85.48 ± 9.9	62.13 ± 9.1	17.34 ± 12.1	<0.001a
Role-Physical	57.78 ± 46.3	99.52 ± 3.5	89.63 ± 24.2	41.29 ± 42.5	0.00 ± 0.0	<0.001a
Bodily Pain	67.02 ± 26.8	96.54 ± 9.9	80.65 ± 20.8	55.90 ± 19.0	38.48 ± 12.9	<0.001a
General Health	48.65 ± 10.7	52.62 ± 4.8	51.23 ± 7.7	47.71 ± 12.5	42.92 ± 12.5	<0.001a
Vitality	48.86 ± 7.9	50.77 ± 3.0	48.35 ± 8.9	51.91 ± 4.2	43.83 ± 10.3	<0.001a
Social Functioning	55.69 ± 23.2	87.74 ± 13.0	59.18 ± 17.7	51.40 ± 8.5	30.47 ± 17.4	<0.001a
Role-Emotional	28.43 ± 44.3	100.00 ± 0.0	29.79 ± 45.2	5.62 ± 18.3	0.00 ± 0.0	<0.001a
Mental Health	48.32 ± 5.7	52.77 ± 4.1	47.40 ± 6.4	47.28 ± 5.5	47.50 ± 4.0	<0.001a

**Table 11:** Multiple comparison analysis of SF-36 survey domains across different age groups. \*: The mean difference is significant at the 0.05 level.

Dependent variable	(i)age	(j)age	Mean difference (i-j)	95% confidence interval		P-value
				Lower Bound	Upper Bound	
Physical functioning (Games-Howell)	40 years and below	40-50 years	13.1751*	10.193	16.157	<0.001
		51-60 years	36.5190*	33.678	39.36	<0.001
		More than 60 years	81.3101*	77.109	85.511	<0.001
	40-50 years	40 years and below	-13.1751*	-16.157	-10.193	<0.001
		51-60 years	23.3439*	19.702	26.985	<0.001
		More than 60 years	68.1350*	63.371	72.899	<0.001
	51-60 years	40 years and below	-36.5190*	-39.36	-33.678	<0.001
		40-50 years	-23.3439*	-26.985	-19.702	<0.001
		More than 60 years	44.7911*	40.112	49.471	<0.001
	More than 60 years	40 years and below	-81.3101*	-85.511	-77.109	<0.001
		40-50 years	-68.1350*	-72.899	-63.371	<0.001
		51-60 years	-44.7911*	-49.471	-40.112	<0.001

Role-physical (Games-Howell)	40 years and below	40-50 years	9.8916*	3.262	16.521	0.001
		51-60 years	58.2271*	46.37	70.084	<0.001
		More than 60 years	99.5192*	98.242	100.796	<0.001
	40-50 years	40 years and below	-9.8916*	-16.521	-3.262	0.001
		51-60 years	48.3355*	34.95	61.721	<0.001
		More than 60 years	89.6277*	83.11	96.145	<0.001
	51-60 years	40 years and below	-58.2271*	-70.084	-46.37	<0.001
		40-50 years	-48.3355*	-61.721	-34.95	<0.001
		More than 60 years	41.2921*	29.497	53.087	<0.001
	More than 60 years	40 years and below	-99.5192*	-100.796	-98.242	<0.001
		40-50 years	-89.6277*	-96.145	-83.11	<0.001
		51-60 years	-41.2921*	-53.087	-29.497	<0.001
Bodily pain (Games-Howell)	40 years and below	40-50 years	15.8895*	9.267	22.512	<0.001
		51-60 years	40.6396*	34.306	46.973	<0.001
		More than 60 years	58.0541*	52.532	63.576	<0.001
	40-50 years	40 years and below	-15.8895*	-22.512	-9.267	<0.001
		51-60 years	24.7501*	17.117	32.384	<0.001
		More than 60 years	42.1646*	35.186	49.143	<0.001
	51-60 years	40 years and below	-40.6396*	-46.973	-34.306	<0.001
		40-50 years	-24.7501*	-32.384	-17.117	<0.001
		More than 60 years	17.4145*	10.709	24.12	<0.001
	More than 60 years	40 years and below	-58.0541*	-63.576	-52.532	<0.001
		40-50 years	-42.1646*	-49.143	-35.186	<0.001
		51-60 years	-17.4145*	-24.12	-10.709	<0.001
General health (Games-Howell)	40 years and below	40-50 years	1.3813	-1.306	4.069	0.541
		51-60 years	4.9075*	1.042	8.774	0.007
		More than 60 years	9.6935*	5.261	14.126	<0.001
	40-50 years	40 years and below	-1.3813	-4.069	1.306	0.541
		51-60 years	3.5262	-0.5	7.553	0.108
		More than 60 years	8.3122*	3.741	12.883	<0.001
	51-60 years	40 years and below	-4.9075*	-8.774	-1.042	0.007
		40-50 years	-3.5262	-7.553	0.5	0.108
		More than 60 years	4.786	-0.539	10.111	0.095
	More than 60 years	40 years and below	-9.6935*	-14.126	-5.261	<0.001
		40-50 years	-8.3122*	-12.883	-3.741	<0.001
		51-60 years	-4.786	-10.111	0.539	0.095
Vitality (Games-Howell)	40 years and below	40-50 years	2.4182	-0.204	5.04	0.082
		51-60 years	-1.1409	-2.727	0.445	0.245
		More than 60 years	6.9411*	3.382	10.5	<0.001
	40-50 years	40 years and below	-2.4182	-5.04	0.204	0.082
		51-60 years	-3.5590*	-6.202	-0.916	0.003
		More than 60 years	4.5229*	0.408	8.638	0.025
	51-60 years	40 years and below	1.1409	-0.445	2.727	0.245
		40-50 years	3.5590*	0.916	6.202	0.003
		More than 60 years	8.0820*	4.508	11.656	<0.001
	More than 60 years	40 years and below	-6.9411*	-10.5	-3.382	<0.001
		40-50 years	-4.5229*	-8.638	-0.408	0.025
		51-60 years	-8.0820*	-11.656	-4.508	<0.001
Social functioning (Games-Howell)	40 years and below	40-50 years	28.5649*	21.896	35.234	<0.001
		51-60 years	36.3359*	31.048	41.624	<0.001
		More than 60 years	57.2716*	49.916	64.627	<0.001
	40-50 years	40 years and below	-28.5649*	-35.234	-21.896	<0.001
		51-60 years	7.7710*	2.474	13.068	0.001
		More than 60 years	28.7068*	21.328	36.085	<0.001
	51-60 years	40 years and below	-36.3359*	-41.624	-31.048	<0.001
		40-50 years	-7.7710*	-13.068	-2.474	0.001
		More than 60 years	20.9357*	14.771	27.101	<0.001
	More than 60 years	40 years and below	-57.2716*	-64.627	-49.916	<0.001
		40-50 years	-28.7068*	-36.085	-21.328	<0.001
		51-60 years	-20.9357*	-27.101	-14.771	<0.001

Role-emotional (Games-Howell)	40 years and below	40-50 years	70.2128*	58.019	82.407	<0.001
		51-60 years	94.3820*	89.307	99.457	<0.001
		More than 60 years	100	100	100	
	40-50 years	40 years and below	-70.2128*	-82.407	-58.019	<0.001
		51-60 years	24.1693*	11.023	37.315	<0.001
		More than 60 years	29.7872*	17.593	41.981	<0.001
	51-60 years	40 years and below	-94.3820*	-99.457	-89.307	<0.001
		40-50 years	-24.1693*	-37.315	-11.023	<0.001
		More than 60 years	5.6180*	0.543	10.693	0.024
	More than 60 years	40 years and below	-100	-100	-100	
		40-50 years	-29.7872*	-41.981	-17.593	<0.001
		51-60 years	-5.6180*	-10.693	-0.543	0.024
Mental health (Games-Howell)	40 years and below	40-50 years	5.36498*	3.0904	7.6396	<0.001
		51-60 years	5.48833*	3.3555	7.6212	<0.001
		More than 60 years	5.26923*	3.2883	7.2502	<0.001
	40-50 years	40 years and below	-5.36498*	-7.6396	-3.0904	<0.001
		51-60 years	0.12336	-2.1737	2.4204	0.999
		More than 60 years	-0.09574	-2.2517	2.0602	0.999
	51-60 years	40 years and below	-5.48833*	-7.6212	-3.3555	<0.001
		40-50 years	-0.12336	-2.4204	2.1737	0.999
		More than 60 years	-0.2191	-2.2238	1.7856	0.992
	More than 60 years	40 years and below	-5.26923*	-7.2502	-3.2883	<0.001
		40-50 years	0.09574	-2.0602	2.2517	0.999
		51-60 years	0.2191	-1.7856	2.2238	0.992

Table 12: Association of SF-36 survey domain scores between male and female participants. a: Significant using Welch's t-test @<0.05 level.

Variables	Total	Gender		P-value
		Male	Female	
Total	299	173	126	-
Physical Functioning	66.24 ± 30.1	63.47 ± 31.1	70.04 ± 28.4	0.062
Role-Physical	57.78 ± 46.3	55.78 ± 47.4	60.52 ± 44.6	0.378
Bodily Pain	67.02 ± 26.8	61.21 ± 27.6	75.00 ± 23.4	<0.001a
General Health	48.65 ± 10.7	47.51 ± 13.2	50.20 ± 5.2	0.016a
Vitality	48.86 ± 7.9	48.96 ± 7.7	48.73 ± 8.2	0.805
Social Functioning	55.69 ± 23.2	54.19 ± 22.6	57.74 ± 23.8	0.192
Role-Emotional	28.43 ± 44.3	24.47 ± 42.4	33.86 ± 46.4	0.074
Mental Health	48.32 ± 5.7	48.86 ± 5.2	47.59 ± 6.3	0.57

Using One-Way ANOVA test, the association of domains with BMI was also evaluated. A higher score was observed for those who were classified as obese compared to normal eight and obese. Moreover, only the general health among 8 domains showed significant association with BMI, suggesting that BMI is not a significant risk factor in evaluating quality of life in relation to health of the respondents (Table 13).

Multiple comparison analysis of SF-36 survey domains against BMI classification was also done using Games-Howell test (Table 14). No significant mean score difference was observed when normal weight was compared with obese status and vice versa (p=0.194). All others not mentioned exhibited mean differences (Table 14).

Marital status of the participants was also evaluated in this study. Result shows that among all SF-36 survey domains, only the role-physical showed significant association with different marital status at P=0.031 according to One-Way ANOVA test (Table 15). The score was highest for single participants (100.00 ± 0.0), followed by those who are divorced (73.21 ± 41.0) and married (56.09 ± 46.5). This result suggests that single participants had better quality of life (related to health) compared to those at married and divorce status, however only significant under role-physical domain. In addition,

the differences in score of single, married and divorced respondents were not obvious under vitality, general health and mental health domains. For the multiple comparison analysis concerning marital status, only the score of married and single and vice versa exhibited mean differences (p<0.001) as per the Games-Howell test results (Tables 15,16).

Table 17 shows that bodily pain (p=0.015), general health (p=0.001) and social functioning (p=0.016) domains exhibited significant association with the educational attainment of the participants based on One-Way ANOVA test. This result suggests that educational level is a risk factor to some domains only. Also, an increasing trend was observe for the social functioning scores as the educational level becomes higher (Table 17).

Multiple comparison analysis shows a significant mean score differences when bodily pain score for high school level was compared with intermediate & below level (p=0.020) as well as with bachelor & master level (p=0.006), when general health score for intermediate & below level was compared with high school level (p=0.020), and when social functioning score for bachelor & master levels was compared with intermediate & below level (p=0.011) as well as with high school educational level (p=0.041) (Table 18).

**Table 13:** Association of SF-36 survey domain scores against the BMI of the participants. a: Significant using One-Way ANOVA Test @<0.05 level.

Variables	Total	BMI			P-value
		Normal weight	Overweight	Obese	
Total	299	67	117	115	-
Physical functioning	66.24 ± 30.1	64.70 ± 30.4	65.98 ± 31.9	67.39 ± 28.2	0.84
Role-physical	57.78 ± 46.3	56.72 ± 44.7	57.26 ± 46.5	58.91 ± 47.2	0.943
Bodily pain	67.02 ± 26.8	63.61 ± 31.0	67.09 ± 29.0	68.94 ± 21.1	0.433
General health	48.65 ± 10.7	43.33 ± 12.1	46.39 ± 10.3	54.03 ± 7.4	<0.001a
Vitality	48.86 ± 7.9	48.51 ± 8.8	49.66 ± 8.1	48.26 ± 7.2	0.372
Social functioning	55.69 ± 23.2	55.41 ± 27.3	57.26 ± 23.4	54.24 ± 20.3	0.608
Role-emotional	28.43 ± 44.3	25.37 ± 42.7	29.63 ± 45.2	28.99 ± 44.5	0.81
Mental health	48.32 ± 5.7	47.76 ± 7.0	49.03 ± 5.7	47.93 ± 4.8	0.226

**Table 14:** Multiple comparison analysis of SF-36 survey domains against BMI classification. \*: The mean difference is significant at the 0.05 level.

Dependent variable	(i)bmi	(j)bmi	Mean difference (ij)	95% confidence interval		P-value	48.32 ± 5.7
				Lower Bound	Upper Bound		
				General health (games-howell)	Normal weight		
Obese	-10.7064*	-14.595	-6.818			<0.001	
Overweight	Normal weight	3.0648	-1.108		7.238	0.194	
	Obese	-7.6416*	-10.406		-4.877	<0.001	
Obese	Normal weight	10.7064*	6.818		14.595	<0.001	
	Overweight	7.6416*	4.877		10.406	<0.001	

**Table 15:** Association of SF-36 survey domains towards marital status of the participants. a: Significant using One-Way ANOVA Test @<0.05 level.

Variables	Total	Marital status			P-value
		Married	Single	Divorced	
Total	299	279	6	14	-
Physical functioning	66.24 ± 30.1	65.63 ± 30.5	84.17 ± 15.3	70.71 ± 25.8	0.28
Role-physical	57.78 ± 46.3	56.09 ± 46.5	100.00 ± 0.0	73.21 ± 41.0	0.031a
Bodily pain	67.02 ± 26.8	66.43 ± 26.6	92.33 ± 12.0	68.00 ± 30.4	0.063
General health	48.65 ± 10.7	48.64 ± 10.7	52.50 ± 4.4	47.14 ± 12.2	0.59
Vitality	48.86 ± 7.9	48.87 ± 7.9	47.50 ± 11.3	49.29 ± 8.1	0.897
Social functioning	55.69 ± 23.2	55.38 ± 23.1	66.67 ± 20.4	57.14 ± 25.3	0.485
Role-emotional	28.43 ± 44.3	28.08 ± 44.1	50.00 ± 54.8	26.19 ± 43.7	0.479
Mental health	48.32 ± 5.7	48.33 ± 5.6	50.67 ± 7.4	47.14 ± 6.9	0.447

**Table 16:** Multiple Comparisons. \*: The mean difference is significant at the 0.05 level. \*: The mean difference is significant at the 0.05 level.

Dependent variable	(i)marital status	(j)marital status	Mean difference (ij)	95% confidence interval		P-value
				Lower Bound	Upper Bound	
Role-Physical (Games-Howell)	Married	Single	-43.9068*	-50.465	-37.348	<0.001
		Divorced	-17.1211	-46.53	12.288	0.313
	Single	Married	43.9068*	37.348	50.465	<0.001
		Divorced	26.7857	-2.132	55.704	0.071
	Divorced	Married	17.1211	-12.288	46.53	0.313
		Single	-26.7857	-55.704	2.132	0.071

**Table 17:** Association of SF-36 survey domains towards educational level of the participants. a: Significant using One-Way ANOVA Test @<0.05 level.

Variables	Total	Educational level		P-value	Single
		Intermediate and below	High school	Bachelor and Master	
Total	299	29	135	135	-
Physical functioning	66.24 ± 30.1	55.17 ± 32.7	65.07 ± 30.1	69.78 ± 29.1	0.05
Role-physical	57.78 ± 46.3	50.86 ± 50.2	52.59 ± 45.2	64.44 ± 45.9	0.076
Bodily pain	67.02 ± 26.8	63.00 ± 25.2	62.95 ± 28.2	71.96 ± 24.9	0.015a
General health	48.65 ± 10.7	51.17 ± 9.4	46.16 ± 11.1	50.59 ± 10.0	0.001a
Vitality	48.86 ± 7.9	47.59 ± 9.1	48.96 ± 8.1	49.04 ± 7.5	0.658
Social functioning	55.69 ± 23.2	47.41 ± 24.9	53.70 ± 22.9	59.44 ± 22.6	0.016a
Role-emotional	28.43 ± 44.3	17.24 ± 38.4	24.94 ± 42.3	34.32 ± 46.8	0.078
Mental health	48.32 ± 5.7	47.31 ± 5.0	48.24 ± 5.9	48.62 ± 5.6	0.518

**Table 18:** Multiple comparison analysis of SF-36 survey domains toward educational level of the participants.\*: The mean difference is significant at the 0.05 level.

Dependent Variable	(I)Educational level	(J)Educational level	Mean Difference (I-J)	95% Confidence Interval		P-value
				Lower Bound	Upper Bound	
Bodily pain (lsd)	Intermediate and below	High school	0.0519	-10.612	10.715	0.992
		Bachelor and Master	-8.9556	-19.619	1.708	0.099
	High school	Intermediate and below	-0.0519	-10.715	10.612	0.992
		Bachelor and Master	-9.0074*	-15.349	-2.666	0.006
	Bachelor and Master	Intermediate and below	8.9556	-1.708	19.619	0.099
General health (lsd)	Intermediate and below	High school	5.0095*	0.795	9.224	0.02
		Bachelor and Master	0.5872	-3.627	4.801	0.784
	High school	Intermediate and below	-5.0095*	-9.224	-0.795	0.02
		Bachelor and Master	-4.4222*	-6.928	-1.916	0.001
	Bachelor and Master	Intermediate and below	-0.5872	-4.801	3.627	0.784
Social functioning (lsd)	Intermediate and below	High school	4.4222*	1.916	6.928	0.001
		High school	-6.2899	-15.525	2.945	0.181
	High school	Bachelor and Master	-12.0307*	-21.266	-2.796	0.011
		Intermediate and below	6.2899	-2.945	15.525	0.181
	Bachelor and Master	Intermediate and below	-5.7407*	-11.233	-0.249	0.041
Bachelor and Master	Intermediate and below	12.0307*	2.796	21.266	0.011	
	High school	5.7407*	0.249	11.233	0.041	

The association of SF-36 survey domains toward the years of having diabetes among the participants was also evaluated. All domains show significant association with years of having diabetes except for the domain, vitality ( $p=0.115$ ). A significant drop in quality of life (related to health) was observed as the years of having diabetes increases from less than 5 years up to 11-15 years under the physical functioning, role-physical, bodily pain, social functioning and role-emotional domains. Specifically, an obvious decrease in role-emotional score was seen as years of having diabetes increases. The result shown in Table 19 implies that participants having diabetes for short years had far better quality of life (health-related) in comparison with those having the disorder for long time, considering significant association towards 7 SF-36 survey domains (Table 19).

Multiple comparison analysis was also done for each domain against “years of having diabetes” age brackets to evaluate the mean differences among scores (Table 20). Only when the physical functioning score for more than 15 years of having diabetes was compared with 11-15 years showed no significant mean difference after employing Least Significant Difference (LSD) test. Using Games-Howell test, only when the role-physical score of those having diabetes for 11-15 years was compared with those having it for >15 years and vice versa, a no significant mean difference ( $p=0.986$ ) was observed. Similar result was observed for bodily pain based on LSD test, indicating that only one no significant mean difference was observed which is when 11-15 years group score was compared with that of more than 15 years ( $p=0.862$ ). All other comparison under bodily pain not mentioned exhibited significant mean differences. For the general health domain mean score comparisons, Games-Howell test was utilized as indicated in Table 20. A significant mean difference was seen when the score of those having diabetes for less than 5 years and 5-10 years were compared with those having it for more than 15 years at  $p=0.010$  and  $p=0.005$ . Similar test was done for the social functioning domain. Result shows that all exhibited significant mean difference except when the social functioning mean score for those having diabetes for 11-15 years was compared with having it for more than 15 years ( $p=0.823$ ). Similar result was seen for the role-emotional domain in which the score of those at 11-15 years group, when compared with those at more than 15 years, showed no significant mean difference at  $p=0.195$ . Moreover, only the less than 5 years group and 5-10 years group exhibited significant mean difference ( $p=0.001$ ) based on Games-Howell test (Table 20).

In assessing the relationship of SF-36 survey domains and hypertension, it was found out that bodily pain with a  $p$  value of 0.002 and general health scores with a  $p$  value of 0.001 showed significant association towards having hypertension using independent  $t$ -test (Table 21). Vitality having  $p$  value of <0.001 and mental health scores having  $p$  value of 0.002 were also significantly associated with having hypertension according to Welch’s  $t$ -test. These imply that having hypertension is a risk factor on certain domains only in measuring the quality of life in relation to health of the participants. Also, a higher health-related quality of life was observed on participants without hypertension as compared to those having it in general (Table 21).

The association of SF-36 survey domains toward years of hypertension occurrence was also examined in this research work (Table 22). Only the vitality domain was not significantly

associated ( $p=0.310$ ) with years of hypertension occurrence among the respondents. For other 7 domains that exhibited significant association, a negative correlation was observed when compared with years of having hypertension. This suggests that the quality of life in relation to health of the participants decreases as the years of hypertension occurrence increases among the participants (Table 22).

Multiple comparison analysis using Games-Howell test shows that the physical functioning score showed significant mean difference when those having hypertension for 6-10 years was compared with more than 15 years group ( $p=0.047$ ) (Table 23). In terms of bodily pain domain, no significant mean difference was observed when the score for 6-10 years group was compared with those having hypertension for five years & below ( $p=0.846$ ) and eleven to fifteen years ( $p=0.156$ ) using similar test. Games-Howell test also revealed significant mean difference for the comparison of general health score for more than 15 years group with that of 5 years & below ( $p=0.000$ ), 6-10 years ( $p=0.001$ ) and 11-15 years group ( $p=0.009$ ). For the social functioning domain, it was found out that the score of group with more than 15 years of hypertension showed significance difference when compared with those having it for 5 years and below ( $p=0.002$ ) and 6-10 years ( $p=0.008$ ). Games-Howell test result for the role-emotional domain also reveals that there was a significant mean difference when the score of more than 15 years group was compared with the score of those having hypertension for 5 years & below ( $p=0.000$ ), 6-10 years ( $p=0.000$ ) and 11-15 years ( $p=0.018$ ). For the mental health domain, significant mean difference was also noted upon comparing the score of more than 15 years group with that of those having hypertension for 6-10 years ( $p=0.0040$ ) and 11-15 years ( $p=0.017$ ). Using LSD method, significant mean difference was also observed for role-physical scores when more than 15 years group was compared with those 5 years & below ( $p=0.003$ ) and 6-10 years group ( $p=0.005$ ) (Table 23).

The smoking factor was also evaluated in this study as shown in Table 24. A relatively higher mean score per domain was observed for those who smoke compared to those who do not. This suggest that smokers group have a higher quality of life related to health, however only significant under general health ( $p<0.001$ ) and role-physical domains ( $p=0.030$ ) according to Independent and Welch’s  $t$ -tests (Table 24).

### Pearson Correlation Analysis of SF-36 Survey Domains and Characteristics of Patients

The correlation between SF-36 survey domains and certain characteristics of the respondents were also evaluated using the Pearson correlation analysis. Table 25 shows the correlation of each domain towards the respective age of the participants, having all domains to exhibit significant negative correlation with age. Specifically, age has strong negative correlation with physical functioning among other domains which is supported by the  $r$  value of -0.939. This suggests that as the age of the participant increases, their quality of life (related to health) decreases (Table 25).

General linear regression model was then utilized to narrow down the most significant factor among all identified risk factors for each domain. Table 26 shows the tests of “between-subjects” effects having physical functioning as dependent variable. The age was found to be the only significant risk factor ( $p<0.001$ ) among other factors with an  $R^2=0.878$  (Table 26).

**Table 19:** Association of SF-36 survey domains toward the years of having diabetes among the participants. a: Significant using One-Way ANOVA Test @<0.05 level.

Variables	Total	Years of having diabetes		P-value	High school		High school
		Less than 5 years	5-10 years		11-15 years	More than 15 years	
Total	299	74	96		61	68	-
Physical functioning	66.24 ± 30.1	86.42 ± 25.2	70.05 ± 26.7		52.46 ± 28.7	51.25 ± 26.9	<0.001a
Role-physical	57.78 ± 46.3	84.12 ± 35.0	63.02 ± 43.5		37.30 ± 45.3	40.07 ± 46.3	<0.001a
Bodily pain	67.02 ± 26.8	85.41 ± 21.8	69.23 ± 23.2		54.44 ± 25.2	55.18 ± 25.8	<0.001a
General health	48.65 ± 10.7	50.64 ± 6.9	51.06 ± 8.3		46.49 ± 13.2	45.00 ± 13.0	<0.001a
Vitality	48.86 ± 7.9	49.32 ± 7.6	50.10 ± 5.5		47.21 ± 11.0	48.09 ± 7.7	0.115
Social functioning	55.69 ± 23.2	70.61 ± 25.1	58.20 ± 21.7		43.85 ± 18.3	46.51 ± 16.3	<0.001a
Role-emotional	28.43 ± 44.3	72.07 ± 44.8	29.86 ± 44.2		4.92 ± 19.1	0.00 ± 0.0	<0.001a
Mental health	48.32 ± 5.7	50.54 ± 6.2	47.50 ± 6.0		46.62 ± 5.4	48.59 ± 4.0	<0.001a

**Table 20:** Multiple comparison analysis of SF-36 domains toward the years of having diabetes among the participants. \*: The mean difference is significant at the 0.05 level.

Dependent variable	(i)years of having diabetes	(j)years of having diabetes	Mean	95% confidence interval		P-value
			Difference (I-J)	Lower Bound	Upper Bound	
Physical functioning (lsd)	Less than 5 years	5-10 years	16.3668*	8.207	24.526	<0.001
		11-15 years	33.9599*	24.838	43.082	<0.001
		More than 15 years	35.1689*	26.308	44.03	<0.001
	5-10 years	Less than 5 years	-16.3668*	-24.526	-8.207	<0.001
		11-15 years	17.5931*	8.957	26.23	<0.001
		More than 15 years	18.8021*	10.442	27.162	<0.001
	11-15 years	Less than 5 years	-33.9599*	-43.082	-24.838	<0.001
		5-10 years	-17.5931*	-26.23	-8.957	<0.001
		More than 15 years	1.209	-8.093	10.511	0.798
	More than 15 years	Less than 5 years	-35.1689*	-44.03	-26.308	<0.001
		5-10 years	-18.8021*	-27.162	-10.442	<0.001
		11-15 years	-1.209	-10.511	8.093	0.798
Role-physical (games-howell)	Less than 5 years	5-10 years	21.1008*	5.467	36.735	0.003
		11-15 years	46.8265*	28.338	65.315	<0.001
		More than 15 years	44.0481*	25.978	62.119	<0.001
	5-10 years	Less than 5 years	-21.1008*	-36.735	-5.467	0.003
		11-15 years	25.7258*	6.692	44.759	0.003
		More than 15 years	22.9473*	4.317	41.577	0.009
	11-15 years	Less than 5 years	-46.8265*	-65.315	-28.338	<0.001
		5-10 years	-25.7258*	-44.759	-6.692	0.003
		More than 15 years	-2.7784	-23.814	18.257	0.986
	More than 15 years	Less than 5 years	-44.0481*	-62.119	-25.978	<0.001
		5-10 years	-22.9473*	-41.577	-4.317	0.009
		11-15 years	2.7784	-18.257	23.814	0.986
Bodily pain (lsd)	Less than 5 years	5-10 years	16.1762*	8.894	23.458	<0.001
		11-15 years	30.9628*	22.822	39.104	<0.001
		More than 15 years	30.2289*	22.321	38.137	<0.001
	5-10 years	Less than 5 years	-16.1762*	-23.458	-8.894	<0.001
		11-15 years	14.7865*	7.079	22.494	<0.001
		More than 15 years	14.0527*	6.591	21.514	<0.001
	11-15 years	Less than 5 years	-30.9628*	-39.104	-22.822	<0.001
		5-10 years	-14.7865*	-22.494	-7.079	<0.001
		More than 15 years	-0.7338	-9.035	7.568	0.862
	More than 15 years	Less than 5 years	-30.2289*	-38.137	-22.321	<0.001
		5-10 years	-14.0527*	-21.514	-6.591	<0.001
		11-15 years	0.7338	-7.568	9.035	0.862

General health (games-howell)	Less than 5 years	5-10 years	-0.4274	-3.472	2.618	0.983
		11-15 years	4.1433	-0.762	9.049	0.128
		More than 15 years	5.6351*	1.012	10.258	0.01
	5-10 years	Less than 5 years	0.4274	-2.618	3.472	0.983
		11-15 years	4.5707	-0.382	9.524	0.081
		More than 15 years	6.0625*	1.389	10.736	0.005
	11-15 years	Less than 5 years	-4.1433	-9.049	0.762	0.128
		5-10 years	-4.5707	-9.524	0.382	0.081
		More than 15 years	1.4918	-4.523	7.507	0.917
	More than 15 years	Less than 5 years	-5.6351*	-10.258	-1.012	0.01
		5-10 years	-6.0625*	-10.736	-1.389	0.005
		11-15 years	-1.4918	-7.507	4.523	0.917
Social functioning (games-howell)	Less than 5 years	5-10 years	12.4050*	2.882	21.928	0.005
		11-15 years	26.7556*	17.003	36.509	<0.001
		More than 15 years	24.1008*	14.922	33.279	<0.001
	5-10 years	Less than 5 years	-12.4050*	-21.928	-2.882	0.005
		11-15 years	14.3507*	5.963	22.739	<0.001
		More than 15 years	11.6958*	3.998	19.394	0.001
	11-15 years	Less than 5 years	-26.7556*	-36.509	-17.003	<0.001
		5-10 years	-14.3507*	-22.739	-5.963	<0.001
		More than 15 years	-2.6549	-10.649	5.34	0.823
	More than 15 years	Less than 5 years	-24.1008*	-33.279	-14.922	<0.001
		5-10 years	-11.6958*	-19.394	-3.998	0.001
		11-15 years	2.6549	-5.34	10.649	0.823
Role-emotional (games-howell)	Less than 5 years	5-10 years	42.2110*	24.312	60.11	<0.001
		11-15 years	67.1540*	52.121	82.187	<0.001
		More than 15 years	72.0721*	58.369	85.775	<0.001
	5-10 years	Less than 5 years	-42.2110*	-60.11	-24.312	<0.001
		11-15 years	24.9431*	11.605	38.281	<0.001
		More than 15 years	29.8611*	18.067	41.655	<0.001
	11-15 years	Less than 5 years	-67.1540*	-82.187	-52.121	<0.001
		5-10 years	-24.9431*	-38.281	-11.605	<0.001
		More than 15 years	4.918	-1.54	11.376	0.195
	More than 15 years	Less than 5 years	-72.0721*	-85.775	-58.369	<0.001
		5-10 years	-29.8611*	-41.655	-18.067	<0.001
		11-15 years	-4.918	-11.376	1.54	0.195
Mental health (games-howell)	Less than 5 years	5-10 years	3.04054*	0.5847	5.4964	0.009
		11-15 years	3.91759*	1.3098	6.5254	0.001
		More than 15 years	1.95231	-0.3254	4.23	0.12
	5-10 years	Less than 5 years	-3.04054*	-5.4964	-0.5847	0.009
		11-15 years	0.87705	-1.5197	3.2738	0.777
		More than 15 years	-1.08824	-3.1157	0.9392	0.505
	11-15 years	Less than 5 years	-3.91759*	-6.5254	-1.3098	0.001
		5-10 years	-0.87705	-3.2738	1.5197	0.777
		More than 15 years	-1.96528	-4.1796	0.249	0.101
	More than 15 years	Less than 5 years	-1.95231	-4.23	0.3254	0.12
		5-10 years	1.08824	-0.9392	3.1157	0.505
		11-15 years	1.96528	-0.249	4.1796	0.101

**Table 21:** Association of SF-36 survey domains towards hypertension of the participants. a: Significant using Independent t-test @<0.05 level. b: Significant using Welch's t-test @<0.05 level.

Variables	Total	Having hypertension		P-value
		Yes	No	
Total	299	162	137	-
Physical functioning	66.24 ± 30.1	64.10 ± 29.8	68.76 ± 30.4	0.184
Role-physical	57.78 ± 46.3	53.70 ± 46.5	62.59 ± 45.7	0.098
Bodily pain	67.02 ± 26.8	62.65 ± 28.3	72.19 ± 24.0	0.002b
General health	48.65 ± 10.7	46.08 ± 12.5	51.68 ± 6.9	<0.001b
Vitality	48.86 ± 7.9	50.25 ± 7.9	47.23 ± 7.6	0.001a
Social functioning	55.69 ± 23.2	55.48 ± 21.4	55.93 ± 25.2	0.869
Role-emotional	28.43 ± 44.3	26.34 ± 43.2	30.90 ± 45.5	0.375
Mental health	48.32 ± 5.7	49.23 ± 5.5	47.24 ± 5.7	0.002a

**Table 22:** Association of SF-36 survey domains toward years of hypertension occurrence. a: Significant using One-Way ANOVA Test @<0.05 level.

Variables	Total	Years of hypertension				P-value
		≤ 5 years	6-10 years	11-15 years	> 15 years	
Total	161	36	63	37	25	-
Physical functioning	63.88 ± 29.7	69.31 ± 29.6	70.00 ± 26.4	56.35 ± 32.4	51.80 ± 29.3	0.014a
Role-physical	53.42 ± 46.5	65.28 ± 47.2	60.71 ± 43.7	45.27 ± 48.2	30.00 ± 41.5	0.009a
Bodily pain	62.42 ± 28.2	74.19 ± 24.1	69.97 ± 25.8	57.97 ± 28.1	33.00 ± 15.9	<0.001a
General health	46.06 ± 12.5	49.61 ± 7.2	48.35 ± 10.5	46.86 ± 12.6	33.96 ± 16.2	<0.001a
Vitality	50.25 ± 7.9	50.97 ± 6.5	50.08 ± 8.9	48.51 ± 8.9	52.20 ± 5.2	0.31
Social functioning	55.20 ± 21.1	63.19 ± 23.7	56.94 ± 21.2	49.66 ± 22.5	47.50 ± 5.1	0.009a
Role-emotional	25.88 ± 43.0	43.52 ± 49.6	29.10 ± 44.2	20.72 ± 40.3	0.00 ± 0.0	0.001a
Mental health	49.19 ± 5.5	50.78 ± 5.9	47.94 ± 6.5	48.54 ± 4.4	51.04 ± 1.7	0.022a

**Table 23:** Multiple comparison analysis of SF-36 survey domains toward the years of hypertension occurrence of the participants. \*: The mean difference is significant at the 0.05 level.

Dependent Variable	(I) Years of hypertension	(J) Years of hypertension	Mean Difference (I,J)	95% Confidence Interval		P-value
				Lower Bound	Upper Bound	
Physical functioning (games-howell)	5 years and below	6-10 years	-0.6944	-16.366	14.977	0.999
		11-15 years	12.9542	-6.132	32.041	0.289
		More than 15 years	17.5056	-2.798	37.809	0.114
	6-10 years	5 years and below	0.6944	-14.977	16.366	0.999
		11-15 years	13.6486	-2.909	30.207	0.141
		More than 15 years	18.2000*	0.164	36.236	0.047
	11-15 years	5 years and below	-12.9542	-32.041	6.132	0.289
		6-10 years	-13.6486	-30.207	2.909	0.141
		More than 15 years	4.5514	-16.405	25.507	0.939
	More than 15 years	5 years and below	-17.5056	-37.809	2.798	0.114
		6-10 years	-18.2000*	-36.236	-0.164	0.047
		11-15 years	-4.5514	-25.507	16.405	0.939
Role-physical (lsd)	5 years and below	6-10 years	4.5635	-14.097	23.224	0.63
		11-15 years	20.0075	-0.902	40.917	0.061
		More than 15 years	35.2778*	12.025	58.531	0.003
	6-10 years	5 years and below	-4.5635	-23.224	14.097	0.63
		11-15 years	15.444	-3.056	33.944	0.101
		More than 15 years	30.7143*	9.602	51.827	0.005
	11-15 years	5 years and below	-20.0075	-40.917	0.902	0.061
		6-10 years	-15.444	-33.944	3.056	0.101
		More than 15 years	15.2703	-7.854	38.394	0.194
	More than 15 years	5 years and below	-35.2778*	-58.531	-12.025	0.003
		6-10 years	-30.7143*	-51.827	-9.602	0.005
		11-15 years	-15.2703	-38.394	7.854	0.194

Bodily pain (games-howell)	5 years and below	6-10 years	4.2262	-9.354	17.806	0.846
		11-15 years	16.2215*	0.103	32.34	0.048
		More than 15 years	41.1944*	27.629	54.759	0
	6-10 years	5 years and below	-4.2262	-17.806	9.354	0.846
		11-15 years	11.9953	-2.873	26.863	0.156
		More than 15 years	36.9683*	24.984	48.953	0
	11-15 years	5 years and below	-16.2215*	-32.34	-0.103	0.048
		6-10 years	-11.9953	-26.863	2.873	0.156
		More than 15 years	24.9730*	10.131	39.815	0
	More than 15 years	5 years and below	-41.1944*	-54.759	-27.629	0
		6-10 years	-36.9683*	-48.953	-24.984	0
		11-15 years	-24.9730*	-39.815	-10.131	0
General health (games-howell)	5 years and below	6-10 years	1.2619	-3.596	5.925	0.894
		11-15 years	2.7462	-3.596	9.089	0.663
		More than 15 years	15.6511*	6.279	25.023	0
	6-10 years	5 years and below	-1.2619	-5.925	3.401	0.894
		11-15 years	1.4843	-4.997	7.966	0.93
		More than 15 years	14.3892*	4.929	23.85	0.001
	11-15 years	5 years and below	-2.7462	-9.089	3.596	0.663
		6-10 years	-1.4843	-7.966	4.997	0.93
		More than 15 years	12.9049*	2.633	23.177	0.009
	More than 15 years	5 years and below	-15.6511*	-25.023	-6.279	0
		6-10 years	-14.3892*	-23.85	-4.929	0.001
		11-15 years	-12.9049*	-23.177	-2.633	0.009
Social functioning (games-howell)	5 years and below	6-10 years	6.25	-6.31	18.81	0.559
		11-15 years	13.5323	-0.719	27.783	0.069
		More than 15 years	15.6944*	4.751	26.638	0.002
	6-10 years	5 years and below	-6.25	-18.81	6.31	0.559
		11-15 years	7.2823	-4.721	19.285	0.387
		More than 15 years	9.4444*	1.951	16.938	0.008
	11-15 years	5 years and below	-13.5323	-27.783	0.719	0.069
		6-10 years	-7.2823	-19.285	4.721	0.387
		More than 15 years	2.1622	-8.123	12.447	0.943
	More than 15 years	5 years and below	-15.6944*	-26.638	-4.751	0.002
		6-10 years	-9.4444*	-16.938	-1.951	0.008
		11-15 years	-2.1622	-12.447	8.123	0.943
Role-emotional (games-howell)	5 years and below	6-10 years	14.418	-11.867	40.703	0.476
		11-15 years	22.7978	-5.134	50.73	0.148
		More than 15 years	43.5185*	21.203	65.834	0
	6-10 years	5 years and below	-14.418	-40.703	11.867	0.476
		11-15 years	8.3798	-14.331	31.091	0.768
		More than 15 years	29.1005*	14.401	43.8	0
	11-15 years	5 years and below	-22.7978	-50.73	5.134	0.148
		6-10 years	-8.3798	-31.091	14.331	0.768
		More than 15 years	20.7207*	2.863	38.578	0.018
	More than 15 years	5 years and below	-43.5185*	-65.834	-21.203	0
		6-10 years	-29.1005*	-43.8	-14.401	0
		11-15 years	-20.7207*	-38.578	-2.863	0.018
Mental health (games-howell)	5 years and below	6-10 years	2.84127	-0.5076	6.1901	0.125
		11-15 years	2.23724	-0.9843	5.4588	0.268
		More than 15 years	-0.26222	-3.0411	2.5167	0.994
	6-10 years	5 years and below	-2.84127	-6.1901	0.5076	0.125
		11-15 years	-0.60403	-3.4685	2.2604	0.946
		More than 15 years	-3.10349*	-5.4346	-0.7724	0.004
	11-15 years	5 years and below	-2.23724	-5.4588	0.9843	0.268
		6-10 years	0.60403	-2.2604	3.4685	0.946
		More than 15 years	-2.49946*	-4.6481	-0.3508	0.017
	More than 15 years	5 years and below	0.26222	-2.5167	3.0411	0.994
		6-10 years	3.10349*	0.7724	5.4346	0.004
		11-15 years	2.49946*	0.3508	4.6481	0.017

**Table 25:** Pearson correlation analysis of SF-36 survey domains toward age of the participants. \*\*: Correlation is significant at the 0.01 level (2-tailed). \*: Correlation is significant at the 0.05 level (2-tailed).

	Correlations		Age
	R	P-value	
Physical functioning			-0.939**
			<0.001
			299
Role-physical			-0.822**
			<0.001
			299
Bodily pain			-0.794**
			<0.001
			299
General health			-0.327**
			<0.001
			299
Vitality			-0.263**
			<0.001
			299
Social functioning			-0.777**
			<0.001
			299
Role-emotional			-0.744**
			<0.001
			299
Mental health			-0.268**
			<0.001
			299

**Table 26:** Tests of between-subjects effects having physical functioning domain as dependent variable. a: R Squared=.884 (Adjusted R Squared=.878).

Source	Type III Sum of Squares	P-value
Corrected model	124877.915a	<0.001
Years of having diabetes	1272.567	0.009
Years of hypertension	1298.82	0.009
Age	98192.425	<0.001

The result of tests of between-subjects having role-physical as dependent variable shows that only age is the significant risk factor ( $p < 0.001$ ). This implies that other factors such marital status, years of having diabetes, years of hypertension and smoking will not exhibit significant effect since age is the only identified significant risk factor in assessing the quality of life (related to health) of the participants. Based from Table 27, priority risk factors are therefore rank as age, followed by years of having diabetes ( $p < 0.046$ ), marital status ( $p < 0.116$ ), smoking ( $p < 0.257$ ) and years of hypertension ( $p < 0.570$ ) with adjusted R-squared value of 0.710 (Table 27).

For the tests involving bodily pain as dependent variable, significant factors ( $p < 0.001$ ) were found at an adjusted R2 value of 0.735 (Table 28). The priority risk factors are therefore ranked as age, followed by gender, years of hypertension, educational level and years of having diabetes (Table 28).

Unlike the result from previous tests, BMI was considered the

significant factor for general health domain, having p value of 0.001 and adjusted R2 value of 0.510 according to results of “between-subjects” effects test (Table 29).

With regard to the tests having vitality as dependent variable, age and having hypertension factors were found to be significant risk factors with a p value of 0.001 and adjusted R2 value of 0.116 (Table 30). For the social functioning domain, only age showed significance ( $p < 0.001$ ;  $R^2 = 0.658$ ) as shown in (Table 31).

Two significant risk factors ( $p < 0.001$ ), age and years of having diabetes, were found from the tests of between-subjects effects having role-emotional domain as dependent variable (adjusted R-squared=0.652) as shown in (Table 32). Lastly, for the tests involving mental health domain, age ( $p < 0.001$ ) together with years of hypertension ( $p < 0.003$ ) were found to be significant risk factors with an adjusted R2 value of 0.157 (Table 33).

**Table 27:** Tests of between-subjects having role-physical domain as dependent variable. a: R Squared=.728 (Adjusted R Squared=.710).

Source	Type III Sum of Squares	P-value
Corrected model	251607.447a	<0.001
Marital status	2738.25	0.116
Years of having diabetes	5122.643	0.046
Years of hypertension	1266.125	0.57
Smoking	811.736	0.257

**Table 28:** Tests of between-subjects effects having bodily pain domain as dependent variable. a: R Squared=.752 (Adjusted R Squared=.735)

Source	Type III Sum of Squares	P-value
Corrected model	95589.562a	<0.001
Gender	3052.634	<0.001
Educational level	1858.78	0.014
Years of having diabetes	320.322	0.678
Having hypertension	0	
Years of hypertension	5397.676	<0.001
Age	36388.884	<0.001

**Table 29:** Tests of between-subjects effects having general health domain as dependent variable. a: R Squared=.550 (Adjusted R Squared=.510)

Source	Type III Sum of Squares	P-value
Corrected model	13786.540a	<0.001
Intercept	11922.185	<0.001
Gender	941.229	0.001
Bmi	2941.005	<0.001
Educational level	659.318	0.015
Years of having diabetes	1047.917	0.004
Having hypertension	0	
Years of hypertension	1388.031	0.001
Smoking	801.366	0.002
Age	452.716	0.016

**Table 30:** Tests of between-subjects effects having vitality domain as dependent variable. a: R Squared=.121 (Adjusted R Squared=.116).

Source	Type III Sum of Squares	P-value
Corrected model	2267.597a	<0.001
Intercept	44190.981	<0.001
Having hypertension	974.786	<0.001
Age	1590.328	<0.001

**Table 31:** Tests of between-subjects effects having social functioning domain as dependent variable. a: R Squared=.677 (Adjusted R Squared=.658).

Source	Type III Sum of Squares	P-value
Corrected model	48357.011a	<0.001
Intercept	71751.689	<0.001
Educational level	75.279	0.782
Years of having diabetes	120.516	0.852
Years of hypertension	271.712	0.621
Age	29527.811	<0.001

**Table 32:** Tests of between-subjects effects having role-emotional domain as dependent variable. a: R Squared=.667 (Adjusted R Squared=.652).

Source	Type III Sum of Squares	P-value
Corrected model	197039.903a	<0.001
Intercept	99322.972	<0.001
Years of having diabetes	20287.153	<0.001
Years of hypertension	1576.203	0.487
Age	71463.639	<0.001

**Table 33:** Tests of between-subjects effects having mental health domain as dependent variable. a: R Squared=.194 (Adjusted R Squared=.157).

Source	Type III Sum of Squares	P-value
Corrected model	948.667a	<0.001
Intercept	13893.908	<0.001
Years of having diabetes	180.799	0.076
Having hypertension	0	
Years of hypertension	366.944	0.003
Age	289.48	0.001

## DICUSSION

In this research work, the quality of life in relation to health along with prevalence and predictors was determined diabetic patients in Makkah. Participants was reported to have an average 9.76 (SD=5.5) years of having diabetes. This is comparable to the result of the works of Subratty and colleagues [19] wherein the average duration of diabetes in their subjects was  $9.3 \pm 7.7$  years. Also, the result of the current study is higher in comparison to the hospital-based cross-sectional study done on diabetic patients in India wherein in majority was having diabetes since 5 years [20].

Comparing the domains with characteristics of the participants, results show that only bodily pain and general health domains exhibited significant association with gender at  $p < 0.05$ . Also, female participants obtained scores higher than males in general, suggesting that female had better quality of life (related to health) compared to males. This is in contrast with the result of AlBuhairan et al. [5] in which they reported female teens in Saudi Arabia to have poor quality of life score in comparison to male respondents. Opposite results were also seen for other Saudi- studies of Al-Hayek and colleagues [10,21]. A cross-sectional study conducted by Shaheen and colleagues [22] in Pakistan as well as the descriptive study of Darvishpoor et al. [23] on general hospital diabetic patients in in Tehran also mentioned that women had attained lower quality of life along with other problems compared to men. The result of current study is also in contrast with that of International study by Papadopoulos and others [9] in Greece wherein higher bodily pain scores in males were reported. Gautam et al. [24] mentioned that significant higher scores in males amongst all eight domains of quality of life were observed compared to Indian females.

The association of SF-36 survey domains toward the years of having diabetes reveals that all domains show significant association with years of having diabetes except for the domain, vitality ( $p=0.115$ ). A significant drop in quality of life (related to health) was observed as the years of having diabetes increases from less than 5 years up to 11-15 years under the physical functioning, role-physical, bodily pain, social functioning and role-emotional domains. This is consistent with the study of Shaheen and colleagues [22] in Pakistan wherein patients having five to ten years duration of diabetes had improved physical functioning score compared to those having it for more than 10 years.

The smoking factor was also evaluated in this study in which a relatively higher mean score per domain was observed for those who smoke compared to those who do not. This suggest that smokers group have a higher quality of life in relation to health, however only significant under general health ( $p < 0.001$ ) and role-physical domains ( $p=0.030$ ) according to Independent and Welch's t-tests.

Pearson correlation analysis shows the correlation of each domain towards the respective age of the participants, having all domains to exhibit significant negative correlation with age. Specifically, age has strong negative correlation with physical functioning among other domains ( $R=-0.939$ ), suggesting that with the increasing age of the participant, their quality of life (related to health) decreases. The age was also found to be the only significant risk factor ( $p < 0.001$ ) among other factors ( $R\text{-squared}=0.878$ ) using general linear regression model. Age was also reported by AlBuhairan and colleagues to be a significant predictor affecting the quality of diabetic Saudi teens. The significant negative correlations of age towards physical functioning scores were also observed for the study of Darvishpoor Kakhki et al. [23] In Tehran. Similar

results was also reported by Shaheen et al. [22] wherein physical functioning score was found to be significantly low for older age groups compared to 40 years of age below ( $p=0.001$ ) in Pakistan. Also, a cross-sectional study in India shows significant reverse correlation of physical functioning, vitality and mental health domains toward age.

## CONCLUSION

This research was conducted to gauge the quality of life (related to health) as well as its prevalence and risk factors among diabetic patients in Makkah. The participants had an average 9.76 (SD=5.5) and 9.58 (SD=4.5) years of having diabetes and hypertension.

Using SF-36 survey, the quality of life (related to health) of the participants was evaluated. The participants obtain highest score on bodily pain domain (Mean=67.02, SD=26.8) while lowest on role-emotional domain (Mean=28.43, SD=44.3). These scores per domain were assessed across different age bracket wherein there was an obvious significant decrease in scores as age decreases for the role-physical, bodily pain, social-functioning and role-emotional domains.

The association of SF-36 survey domain scores and certain characteristics of the participants was then evaluated. Using Welch's t-test, only bodily pain and general health domains exhibited significant association with gender at  $p < 0.05$ , suggesting that all participants have high quality of life (related to health) under these two domains. Also, female participants had higher scores compared to male in general. Higher score was observed for obese respondents compared to normal eight and obese, however only significant under general health domain. Result for the marital status factor shows that only the role-physical domain showed significant association ( $p=0.031$ ) among all domains in accordance to One-Way ANOVA test. The score was highest for single participants ( $100.00 \pm 0.0$ ), suggesting that single participants had enhanced quality of life (related to health) in comparison to those at married and divorce status, however only significant under role-physical domain. On the other hand, bodily pain ( $p=0.015$ ), general health ( $p=0.001$ ) and social functioning ( $p=0.016$ ) domains were found to be significantly associated with the educational attainment of the participants based on One-Way ANOVA test, implying that educational level is a risk factor to some domains only. When it comes to the years of having diabetes, all domains show significant association except for the domain, vitality ( $p=0.115$ ). A significant drop in quality of life (related to health) was observed as the years of having diabetes increases from less than 5 years up to 11-15 years under the physical functioning, role-physical, bodily pain, social functioning and role-emotional domains, suggesting that participants having diabetes for short years had far better quality of life (related to health) in comparison with those having it for long time, considering significant association towards 7 SF-36 survey domains. Moreover, bodily pain ( $p=0.002$ ) and general health scores ( $p < 0.001$ ) showed significant association towards having hypertension using independent t-test. Vitality ( $p < 0.001$ ) and mental health scores ( $p=0.002$ ) were also significantly associated with having hypertension according to Welch's t-test, implying that having hypertension is a risk factor on certain domains only. When it comes to years of hypertension occurrence, all domains except for the vitality exhibited significant negative correlation, suggesting that the quality of life (related to health) of the participants decreases as the years of hypertension occurrence increases among the participants. Based on Independent and Welch's t-tests, a relatively

higher mean score per domain for those who smoke compared to those who do not, implying that smokers group have a higher quality of life in relation to health, however only significant under general health ( $p < 0.001$ ) and role-physical domains ( $p = 0.030$ ).

Pearson correlation analysis was also employed between SF-36 survey domains and certain characteristics of the respondents. Results shows that all domains exhibit significant negative correlation with age, suggesting that as the age of the participant increases, their quality of life (related to health) decreases.

General linear regression model was used identify the most significant risk for each domain. For the tests of "between-subjects" effects having physical functioning as dependent variable, the age was found to be the only significant risk factor ( $p < 0.001$ ;  $R^2 = 0.878$ ) among other factors. Similar result was observed for the role-physical variable. For bodily pain variable, significant factors are ranked as age, followed by gender, years of hypertension, educational level and years of having diabetes. On the other hand, BMI was considered as significant factor ( $p < 0.001$ ;  $R^2 = 0.510$ ) for the variable, general health. When it comes to vitality, age and having hypertension factors were found to be significant risk factors ( $p < 0.001$ ;  $R^2 = 0.116$ ). Only age showed significance ( $p < 0.001$ ,  $R^2 = 0.658$ ) for the social functioning domain. Two significant risk factors ( $p < 0.001$ ), age and years of having diabetes, were found from the tests role-emotional variable. Lastly, age ( $p < 0.001$ ) and years of hypertension ( $p < 0.003$ ) were determined to be significant risk factors for the tests involving mental health domain. Overall, age was found to be the major significant risk factors among all SF-36 domains.

## RECOMMENDATIONS

Conducting further studies involving large sample size is highly recommended in order to validate the current findings and to obtain additional facts on quality of life (health-related) of larger population including non-diabetic subject which could be helpful in the generalization of this research findings.

## ACKNOWLEDGMENT

The author would like to express his gratitude to all people who helped and supported him in completing this research: To my supervisor, Dr. Rajaa Al-Raddadi, for all the hands-on guidance, help and assistance throughout the whole duration of this work. To my loved ones for the support and encouragement. To all diabetic patients in Makkah who participated in this study. And to all and to those I failed to mention. Thank you!

## REFERENCES

- Aathira R, Jain V. Advances in management of type 1 diabetes mellitus. *World J Diabetes*. 2014;5(5):689-96.
- Naeem Z. Burden of diabetes mellitus in Saudi Arabia. *Int J Health Sci (Qassim)*. 2015;9(3): V-VI.
- Mokdad AH, Tuffaha M, Hanlon M, El Bcheraoul C, Daoud F, Al Saeedi M, et al. Cost of diabetes in the Kingdom of Saudi Arabia, 2014. *J Diabetes Metab*. 2015;6(8).
- American Diabetes Association. Diagnosis and classification of diabetes mellitus. *Diabetes Care*. 2010;33 Suppl 1:S62-9.
- AlBuhairan F, Nasim M, Al Otaibi A, Shaheen NA, Al Jaser S, Al Alwan I. Health related quality of life and family impact of type 1 diabetes among adolescents in Saudi Arabia. *Diabetes Res Clin Pract*. 2016;114:173-9.
- Tight blood pressure control and risk of macrovascular and micro vascular complications in type 2 diabetes: UKPDS 38. *Uk Prospective Diabetes Study Group. BMJ*. 1998;317(7160):703-13.
- Cochran J, Conn VS. Meta-analysis of quality of life outcomes following diabetes self-management training. *Diabetes Educ*. 2008;34(5):815-23.
- Redekop WK, Koopmanschap MA, Stolk RP, Rutten GE, Wolffenbuttel BH, Niessen LW. Health-related quality of life and treatment satisfaction in Dutch patients with type 2 diabetes. *Diabetes Care*. 2002;25(3):458-63.
- Papadopoulos AA, Kontodimopoulos N, Frydas A, Ikonomakis E, Niakas D. Predictors of health-related quality of life in type II diabetic patients in Greece. *Bmc Public Health*. 2007;7:186.
- Al-Hayek AA, Robert AA, Abbas HM, Itani MB, Al-Saeed AH, Juhani AE, et al. Assessment of health-related quality of life among adolescents with type 1 diabetes mellitus in Saudi Arabia. *Saudi Med J*. 2014; 35(7):712-7.
- Al-Shehri AH, Taha AZ, Bahnassy AA, Salah M. Health-related quality of life in type 2 diabetic patients. *Ann Saudi Med*. 2008; 28(5):352-60.
- Al-Aboudi IS, Hassali MA, Shafie AA, Hassan A, Alrasheedy AA. A cross-sectional assessment of health-related quality of life among type 2 diabetes patients in Riyadh, Saudi Arabia. *Sage Open Med*. 2015;3:1-6.
- Abolfotouh MA, Salam M, Al-Turaif D, Suliman W, Al-Issa H, Alrowaily M. Predictors of quality of life and glycemic control among Saudi adults with diabetes. *AJOL-IJMMS*. 2013;464:2051-5731.
- Al-Maskari MY, Al-Shookri AO, Al-Adawi SH, Lin KG. Assessment of quality of life in patients with type 2 diabetes mellitus in Oman. *Saudi Med J*. 2011;32(12):1285-90.
- Akinci F, Yildirim A, Gozu H, Sargin H, Orbay E, Sargin M. Assessment of health-related quality of life (HRQoL) of patients with type 2 diabetes in Turkey. *Diabetes Res Clin Pract*. 2008;79(1):117-23.
- Misra R, Lager J. Predictors of quality of life among adults with type 2 diabetes mellitus. *J Diabetes Complications*. 2008;22(3):217-23.
- Kalda R, Ratsep A, Lember M. Predictors of quality of life of patients with type 2 diabetes. *Patient Prefer Adherence*. 2008;2:21-6.
- Subratty AH, Anathallee Y, Jowaher V, Lan Cheong Wah MF. Quality of life of people with type 2 diabetes in Mauritius-research. *Diabetes Prim Care*. 2003;5(4):183-6.
- Kumar S, Koppad R, Chandrashekar SV. Quality of life of type 2 diabetes patients in a tertiary care hospital in southern part of India, Shimoga, Karnataka: A cross-sectional study. *Int J Community Med Public Heal*. 2016;3(7):1723-8.
- Naughton MJ, Yi-Frazier JP, Morgan TM, Seid M, Lawrence JM, Klingensmith GJ, et al. Longitudinal associations between sex, diabetes self-care, and health-related quality of life among youth with type 1 or type 2 diabetes mellitus. *J Pediatr*. 2014;164(6):1376-83.
- Shaheen F, Abdul Basit K, Riaz M, Fawwad A, Hakeem R, Basit A. Assessing health related quality of life in diabetic subjects by SF 36 questionnaire in a tertiary care diabetes unit of Karachi, Pakistan. *Int J Adv Res*. 2014;2(6):13-7.
- Darvishpoor Kakhki A, Abed Saeedi Z. Health-related quality of life of diabetic patients in tehran. *Int J Endocrinol Metab*. 2013;11(4):e7945.
- Gautam Y, Sharma A, Agarwal A, Bhatnagar M, Trehan RR. A cross-sectional study of QOL of diabetic patients at tertiary care hospitals in Delhi. *Indian J Community Med*. 2009;34(4):346-50.