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Prediction of physical activity among Type-2 diabetes patients attending Jimma University specialized Hospital, southwest Ethiopia: Application of health belief model

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Abstract: Background: Physical activity is one of the most important factors for creating, maintaining and improving health of diabetes patients. It plays a key role in the management of type-2 diabetes control. Therefore the aim of this study was to investigate predictor of physical activity among type-2 diabetes patients based on Health Belief Model. Methods: from a total 1237 follow up diabetes mellitus type-2 patients, Facility based cross-sectional study was conducted among 322 of them at Jimma University Specialized Hospital in 2013 at Jimma University Specialized Hospital from March to Aprill,2013 The sample was taken using systematic random sampling technique. Data was collected using pretested questionnaire. A summery descriptive statistics, binary and multiple logistic regression analysis were computed to assess predictors of physical activity among diabetes mellitus type-2 patients. Result: Majority of the study respondents 225(70.5%) were males and the mean age was 55.3(SD±5.7) years. Majority of them have high perceived susceptibility 242(75.9%) and 260(81%) of the respondent had high perceived severity. Majority of the respondents had less perceived barriers 314(98.4%) and high perceived benefit 301(94.4%) while 154(48.3 %) of the respondents had high perceived self-efficacy. Only 39(11%) followed the recommended physical activity practices on diabetes. Conclusion: Patients with poor knowledge of the recommended physical activity were less likely to practice the recommended physical activity. People who were more educated, middle income had high perceived severity of diabetes; less perceived barriers and high perceived self-efficacy were more likely to engage in the recommended physical activity. To increase the engagement of physical activity, diabetes message should focus on knowledge of the recommended physical activity, severity of diabetes and how to overcome the barriers by building one's self efficacy to engage in the recommended physical activity by segmenting the audiences based on income and educational status by creating awareness on recommended physical activity to be performed per a week including the time.

Keywords: Predictor, Recommended Physical Activity, Diabetes Mellitus ,Type-2 Diabetes Patients, Health Belief Model, Jimma University Specialized Hospital

1. Introduction

Diabetes mellitus (DM) is a syndrome constituting a public health problem due to its high prevalence, morbidity, mortality, and treatment cost. It is estimated that the number of individuals with DM worldwide will be 42% higher by 2030. Person living with diabetes mellitus type-2 suffers from different problems such as morbidity and mortality risks which is due to cardiovascular, renal and neurologic complications. The prevalence of type-2 diabetes is also increasing rapidly and compromises a major health burden globally [1]. Diabetes mellitus is the fifth leading cause of death in most high-income countries and there is substantial evidence that it is epidemic in many low- and middle-income countries [2]. According to WHO report the number of adults with diabetes in the world is predicted to increase from 150

million in 2000 to 300 million in 2025. In industrialized countries, the number of diabetics will increase by about one third between 2000 and 2025, while in developing countries that number wills more than double. In 2025, more than 75% of the world's diabetic population will be living in developing countries [3, 4].

Worldwide there are 220 million people living with diabetes mellitus type-2. The increased prevalence of type-2 diabetes mellitus is related with the aging population, a significant rise in the prevalence of obesity and a sedentary lifestyle. Indeed, 60 to 90% of type-2 diabetes cases appear to be related to obesity or weight gain. Moderate increase in physical activity and weight loss of 5% of initial body weight can reduce the risk of developing type-2 diabetes by 58%. The long-term complications of diabetes, such as micro- and macrovascular disease and neuropathy, can be delayed or prevented with appropriate intervention, including lifestyle changes. Lifestyle change strategies that combine diet, physical activity and behaviour modification are effective treatments for improving diabetic outcomes [5].

The highest percentages of increases in disease prevalence are likely to be in developing nations, with major increases in the Middle-East, Sub-Saharan Africa, South Asia, and Latin America. The majority of persons with diabetes mellitus in industrialized countries are in the older age group, the majority in developing countries tend to be middle-aged and at the most productive stage of life. Many Eastern Mediterranean countries are now reporting the onset of type-2 diabetes mellitus at an increasingly young age. In some countries diabetes mellitus type-2 is emerging in children .The onset of at the young age is extends the potential problem of treatment and complication to even younger people and with the longer time of lifespan[6]. Diabetes has a major economic impact, especially in low and middle income countries. More than 80% of spending on medical care for diabetes is in the world's richest countries, even though 80% of the people with diabetes live in low and middle income countries, where 76% of the burden lies. Good health of the workforce is a major factor in economic development; the burden of illness caused by diabetes and the reduction in life expectancy in sub-Saharan Africa will hinder the region's economic growth. As diabetes presents during the peak income-earning period in an individual's life, those affected are often the bread winners of their family. Loss of primary income in households can lead to despair and poverty [7].

Data on the condition of people with diabetes in sub-Saharan Africa and the complications of diabetes that they suffer is very scarce. However, it is estimated that at least 4.51 million have eye complications, 2.23 million need dialysis because of kidney damage, 907,500 have cardiovascular disease, 423,500 are blind because of diabetes, 399,300 have cerebrovascular disease and 169,400 have lost a foot because of amputation [7].

DM is a leading cause of end-stage renal failure, blindness, and limb amputation. While there have been substantial improvements in the amount of knowledge concerning how best to treat patients with DM, including advancements in screening and pharmacologic therapies, patient self-care remains central to preventing complications [8].

Some of the lowest incomes per head in the world. Available data strongly link the present epidemiological transition in sub-Saharan Africa with so-called westernization of lifestyle, characterized by decreased amounts of physical activity and increased consumption of energy-dense or high-fat diets as a result of rapid urbanization. Although lower amounts of physical activity in urban versus rural areas is intuitively plausible, most studies of physical activity have used self-reported information, mainly with questionnaires that have not been validated in the population. Few studies have implemented locally validated questionnaires to show an urbanization gradient and an increased risk of diabetes associated with reduced amounts of physical activity [9].

World health organization has estimated the number of diabetic cases in Ethiopia to be 800,000 by the year 2000; and the number is expected to increase to 1.8 million by 2030. However, due to the widening of social differences in economic status, circumstantial evidences show that the urban population is facing higher level of overweight and obesity [10].

The research team from Jimma University conducted a cross-sectional study of chronic disease and risk factors for chronic disease in 4,469 adults from the population around Gilgel Gibe Field Research Centre in southwest Ethiopia using the World Health Organization's STEPS protocol. They found an overall prevalence of chronic disease of 8.9% (diabetes 0.5%, cardiac disease 3%, hypertension 2.6%, asthma 1.5%, epilepsy 0.5%, depression 1.7%), and 80% of the subjects studied had at least one risk factor for chronic disease. The data on prevalence of chronic diseases were dependent on subjects reporting that they had been given a diagnosis by a health professional. When a sample was screened for hypertension and diabetes, the prevalence of hypertension was found to be 3.5 times higher than that reported by the subjects and the prevalence of diabetes six times higher, indicating a large hidden burden of disease [10].

In Ethiopia, national data on prevalence and incidence of diabetes are lacking. However, patient attendance rates and medical admissions in major hospitals are rising. A population based study in northwestern Ethiopia (Gondar) showed an overall prevalence of diabetes and impaired glucose tolerance of 0.5%; a surprising low prevalence could be because most of the subjects were young (86%). Furthermore the prevalence of diabetes among older subjects (age > 40 years) was higher (2.4%). Moreover, Cohen *et al* reported a high prevalence of diabetes (8.9%) among young (age < 30 years) Ethiopian Jews who have been to Israel for less than 4 years [4].

To prevent serious morbidity and mortality, diabetes treatment requires dedication to demanding self-care behaviors in multiple domains, including food choices, physical activity, proper medications intake and blood glucose monitoring .A study showed that older adults were

very compliant with taking medication but were only moderately compliant to diet and self glucose monitoring and least compliant to exercise. Finding on the same study showed that 60 percent of the study respondents reported that understanding their diet was a barrier for self care

Furthermore other study has shown that poor glycemic control is correlated with longer duration of being diabetic and the occurrence of late complications. [11].

Finding from a study of self-care practice of diabetes patient in Harari, Eastern Ethiopia showed that very few patients 87(39.2%) practiced the recommended self-care practice. Among the recommended self-care behaviors, drug adherence 174(78.4%) and dietary intake 128(57.7%) were the most practiced recommended self care behaviors than others. On the other hand, regular exercise was the least practiced behavior [11].

Across-sectional study done on self-care practice in Jimma University Specialized Hospital, South- west Ethiopia indicated that from 343 diabetes patients attending the hospital regarding physical activity, 69 respondents (20.2%) reported that they were taking necessary precautions when engaged in unusual exercise or 'first-time 'exercise. Similarly,166 respondents (48.5%) walked for 15 min –30 min per day[12].

Different studies on the prevalence of physical inactivity indicated that in people with diabetes and at highest risk for developing type-2 diabetes is limited. In a large health maintenance organization, 29% of patients with diabetes engaged in physical activity (~30 min) once a week or less. In a survey of adults aged ~55 years with type-2 diabetes, 55% of respondents reported no weekly physical activity. Recent data from the National Health and Nutrition Examination Survey found that less than one-third of diabetic adults who can exercise voluntarily met recommended levels of physical activity. Yet, the awareness of the need for physical activity appears high among adults with diabetes, as approximately three-quarters recalled having been told at least once by a health care professional that they needed to exercise more [13].

We used Health Belief Model as a conceptual model for understanding and predicting the likelihood of engaging recommended physical activity as influenced by specific health beliefs related to the health problem and recommended health actions.

We utilized the model with respect to diabetes to its essential hypothesis that physical inactivity increases as a function of the patient's perceptions of greater susceptibility to the illness, greater disease severity, including related complications, more perceived benefits of physical activity (i.e. perception of individuals about the benefits of physical activity and its effectiveness), fewer perceived barrier to engage in physical activity (i.e. individuals own evaluation of obstacles to engage in the recommended physical activity), more social cues or prompts to physical activity and greater self efficacy to engage in the recommended physical activities (i.e. Perception about individuals ability to perform physical activity) [14].

2. Methods

Facility based cross-sectional study design was employed from March 20, to April 27, 2013 in Jimma University Specialized Hospital. The hospital is located in Jimma City, 357 km away from Addis Ababa to southwest Ethiopia. The hospital is a referral centre for the South-Western part of Ethiopia. Currently it became the only teaching and referral hospital in the southwestern part of the country. It provides services for approximately 9000 inpatient and 80000 outpatient attendances a year coming to hospital from the catchment population of about 15,000 million people**.**

Source population of the study was all diabetes mellitus type-2 patients attending diabetes clinic of Jimma University Specialized Hospital for follow up. The study Population were selected patients of diabetes mellitus type-2. The sample size was determined using the formula for estimating a single population proportion. Sample size was calculated by taking the proportion of physical activity which is 50 % on diabetes type-2 with 95% confidence level and 5% margin of error to get an optimum sample size that allowed the study to look into various aspect of physical activity among diabetes mellitus type-2 patients. Since the number of diabetes mellitus type-2 attending Jimma University Specialized Hospital is 1237 and the source population is less than 10,000 the sample size is adjusted with correction formula Accordingly the required sample size was 322. A patient was included in the study if he/ she was diagnosed as diabetes mellitus type-2 for at least six months and has been part of a follow-up programme of Jimma University Specialized Hospital diabetic clinic.

A systematic random sampling procedure was employed to select study participants. The diabetic clinics provide their services only two days per week (i.e. Mondays and Tuesdays); on average150 patients with T2 DM are treated per week whilst 600 patients are treated per month. Based on the decision to collect data over the course of one month, the sampling interval was determined by dividing the expected number of diabetic type-2 patients per month into the sample size (322) which gives approximately a sampling interval of two however adding one week extra data collection time was needed to obtain desired sample size.

Data was collected by two trained BSc nurses using face to face interview method. We used a questionnaire with the internal consistency of $\alpha = 0.82$ [11] in the study. The questionnaire was prepared in English then translated in to Amharic language (local language) and back translated in to English language by another person to check its semantic equivalence. It was also pretested in Agaro Health Center which is 55 kilo meter far from the study area. The instrument contains socio-demographic, socioeconomic, knowledge of diabetes, knowledge of physical activity, cues to action, perceived barriers, perceived benefits, perceived self-efficacy, perceived susceptibility ,perceived severity and physical activity practice condition.

We measured the likelihood of engagement in the recommended physical activity using 7 items, we classified

the likelihood of engaging in the recommended physical activity as 'high recommended physical activity' and 'below recommended physical activity'. The respondents were labelled to have "high recommended physical activity" if he/she practiced three days per a week at least for 30 minute continuously. To measure Perceived [susceptibility(9 items),severity(4 items),benefit(5 items),barrier(6 items) and self-efficacy(7 items) were used. The labelled values of the different items were summed and the percentage computed for each patients. We labeled the respondents to have this constructs based correct response of 60 % or more as high, and less than 60% as less of the above constructs.

We measured general knowledge of the respondent on diabetes and physical activity for the management of diabetes complication. Respondents were categorized as having good general knowledge on diabetes if they scored above the mean value; Poor knowledge about Diabetes Mellitus if the respondents scored below the mean value. knowledge on physical activity was categorized as good knowledge about Physical activity if the respondents were scored above the mean value and Poor knowledge about Physical activity if he/she scored below the mean value . BMI was calculated and was classified as underweight, normal weight, overweight and obese. Weight and height measurements were taken during their routine check up at the health care facilities.

Then double data entry was made using Epi-data 3.1software.After data processing, analysis was made using SPSS version 20.0. A summary descriptive statistics was computed for most variables such as socio-demographic data. Backward stepwise logistic regression analysis was applied to describe the functional independent predictors of physical activity. A point estimates of Odds ratio (OR) with 95% confidence interval (CI) were determined to assess the strength of association between independent and dependent variable. For all statistical significant tests p- value < 0.05 was used as a cut-off point. The study was ethically approved by the health research and post graduate coordinating office, college of Public health and medical science of Jimma University. Verbal consent was obtained from each study participants before each interview and confidentiality was assured.

2.1. Ethics Statement

Jimma University ethical committee of college of Public Health and Medical Sciences approved this study. Verbal consent was obtained from each respondent and the ethical committee approved the procedure since the study was a survey and with no any harm to the respondents.

3. Result

3.1. Socio-Demographic Characteristics

A total of 322 type-2 diabetes patients were involved in this study. Among them 319 turned out with complete response making the response rate 99.1%. Among 319 respondents, 225(70.5%) were males and 94(29.5%) were females. The mean age of the respondents was 55.3 (SD±5.7) ranged from 42 to 65 years. Respondents greater than 55 years old constituted the highest, accounting 166(52.0%).

As to the religion 187(58.6%) belonged to the Muslim followed by orthodox Christianity 123(38.6%), Protestant and the Catholics rest 9(2.8%).Regarding the occupation 97(30.4%) of the respondents were governmental employee and 85(26.6%) were farmers. The mean average monthly income was 876.5(SD±62.2) ET Birr or 47.1 USD. 94 (29.5%) study subjects had a family history of diabetes, but the majority, 225(70.5%) had no such history (Table_1)

Table 1. *Socio-demographic characteristics of patients with type-2 diabetes in Jimma University Specialize Hospital; South west Ethiopa,2013.*

Variables	No of Subjects	% of study population
Gender		
Male	225	70.5
Female	94	29.5
Age		
18-25	0	0.0
26-35	0	0.0
36-45	16	5.0
46-55	137	43.0
>55	166	52.4
Mean±SD 55.3±5.7		
Religion		
Orthodox	123	38.6
Muslim	187	58.6
*Others	2	0.6
Educational status		
Unable to read and write	52	16.3
Below Grade six	94	29.5
Between Grade 6-12	63	19.7
Above Grade 12	110	34.5
Income per Month		
Low	110	57.9
Middle	54	28.4
High	23	12.1
Very High	3	1.6
Mean±SD 876.5 ±62.2		

*Others: Protestant, Catholics, etc

3.2. Background Information and Cues to Action

The mean duration since medically diagnosed for diabetes was 4.9(SD±2.3) years. The mean BMI was 22.8(SD±2.8) and most of them 239(74.9%) where found in the normal weight category, but 68(21.3%) were obese. Two hundred thirty (72.1%) heard about importance of physical activity for the management of diabetes complication in the last one month; among these 215(48.3%) of them heard from more than one source. The main source of information was Medias and Health professional which accounted 191(42.9%) and 128(28.8%) respectively_ (Table 2).

Table 2. *Background information and cues to action of type-2 patients in JUSH, Jimma Southwest, Ethiopia, 2013.*

Variables	No of Subjects	% of study population
BMI(Body Mass Index)		
Under Weight	12	3.8
Normal Weight	239	74.9
Over Weight	68	21.3
Mean±SD 22.83±2.80		
Cues to action		
Have you heard about importance of physical activity in previous month		
Yes	230	72.1
No	89	27.9
Source of information		
Diabetes patient in family	11	2.5
Health professional	128	28.8
Media	191	42.9
Friends	21	4.7
Son/daughter of patients without DM	74	23.2
Print materials	20	6.3
Frequency of information heard		
Low	194	85.8
High	32	14.2

3.3. Knowledge of Diabetes Mellitus

Majority of the respondents 275(87.5%) had good general knowledge about diabetes. Overwhelming majority 316(99.1%) of the respondents were knowledgeable about the classic sign and symptoms of diabetes. About 296(92.8%) of the respondents were responded that it is possible to control or manage diabetes nevertheless 23(7.2%) of the respondent replied it is impossible to control diabetes giving a reason that they were tried and the blood glucose level get uncontrolled. Majority 298(93.4%) had knowledge at least one of the complication which result from diabetes.

3.4. Knowledge of Physical Activity

One hundred one 31.7 % of the respondents had general knowledgeable about physical activity and majority of the respondents two hundred eighteen 68.3% had no general knowledge about physical activity. An overwhelming majority of respondents, 312(97.8%) replied that it is possible to control diabetes by engaging in physical activity. One hundred one 31.7% of the respondent reported that they know the recommended physical activity among these substantial proportion 56(55.4%) reported that three times a week. Many of the respondents 281(88.1) reported that they perform below the recommended level of physical activity of the diabetes patients.

3.5. Perceived Susceptibility and Severity

Perceived susceptibility to diabetes complications indicated that 242(75.9%) of the study participants had high perceived susceptibility and the remaining 77(24.1%) less perceived susceptibility to diabetes complication. Regarding perceived severity of diabetes and its related complications a total of 260(81.5%) of the respondent had high perceived severity. The other 59(18.5%) had less perceived severity of diabetes and its related complications.

3.6. Perceived Barriers and Benefit

Among the total respondents there was 5(1.6%) high perceived barrier to engage in the recommended physical activity. In contrast, majority of the respondents 314(98.4%) had less perceived barrier to practice the recommended physical activity. Furthermore, the perception of the respondents about benefit of physical activity indicated that the majority of them 301(94.4%) had high perceived benefit of physical activity in the management of diabetes complication. The remaining 18(5.6%) of the respondents had less perceived benefit to physical activity in management of diabetes related complications.

3.7. Perceived Self-Efficacy

The respondents self-efficacy to engaging in the recommended physical activity related to diabetes complication management revealed that 154(48.3%) had high self efficacy and 165(51.7%) had less self efficacy to engage in the recommended physical activity (Table 3) .

3.8. Physical Activity Practice

Thirty eight (11.9%) practiced the recommended physical activity and did specific exercise session for thirty minute last seven days. However 281(88.1%) of the respondents were not practiced the recommended physical activity within seven days of the data collection time. among the respondent 46(14.4%) did any activity for thirty minute which is continuous and including walking and the majority 273(85.6%) were did not engaged in exercise for thirty minute exercise.

Table 3.*Perception of Patients with diabetes on physical activity in Jimma University Specialized Hospital; Southwest Ethiopia, 2013.*

Variables	No of Subjects	% of study population
Perceived susceptibility to diabetes complications		
Less	77	24.1
High	242	75.9
Perceived severity of Diabetes and its complications		
Less	59	18.5
High	260	81.5
Perceived barriers to physical activity		
Less	314	98.4
High	5	1.6
Perceived benefits of physical activity		
Less	18	5.6
High	301	94.4
Self efficacy to perform recommended physical activity		
Less	165	51.7
High	154	48.3

3.9. Predictors of Physical Activity

Using multiple logistic regression of all the significantly associated variable in the bivariate were found to have statistically significant association with the likelihood of engaging with the recommended physical activity ($p <= 0.05$). These variables were educational status , income per month,

knowledge of the recommended physical activity, perceived severity, perceived barriers and perceived self-efficacy were significantly associated with the likelihood of engaging in the recommended physical activity. According to the multivariate analysis patients with middle income were 11.5 times more likely to perform the recommended physical activity [AOR =11.5, 95% CI (0.12,0.81)] than patients with low income. On the other hand, diabetic patients with very high income were 0.6 times less likely to perform the recommended physical activity than less income [AOR=0.6, 95%CI(0.04,0.32)].Individuals with above grade 12 educational status were four times more likely to perform the recommended physical activity than unable to read and write individuals [AOR=4.3, 95%CI (0.29,3.12)]. Regarding knowledge of the recommended physical activity those who knows the recommended physical activity to be performed per a week were two times more likely engaged in the recommended physical activity [AOR=2, 95% CI (0.31, 4.0)] than patients who do not know the recommended physical activity to be performed. Individuals of high perceived severity of the disease and its complications were 7.3 times more likely to engage in physical activity than less perceived severity [AOR=7.3, 95%CI 7.3(0.19,2.80)]. Individuals who had high perceived barriers to physical activity were 0.9 times less likely to perform physical activity than with less perceived barriers [AOR=0.9 95%CI (0.40,8.35)].Individual with high perceived self efficacy had nearly six times more likely to engage the recommended high physical activity [AOR=5.9, 95%CI (0.64, 0.96)] than less perceived self efficacy_ (Table 4).

Table 4. *Multivariate Analysis showing independent predictors of the likelihood engaging in the recommended physical activity, JUSH Southwest Ethiopia,2013.*

Variables	Recommended Physical activity		COR(95% CI)	AOR(95% CI)	P.value
	Yes	No			
Educational status					
Unable to read and write	2	50	1.0	1.0	0.97
Below Grade six	6	88	1.8(0.77,0.98)	2.9(1.25,4.21)	0.10
Between Grade 6-12	5	58	1.1(0.06,0.39)	1.3 (0.11, 0.51)	0.99
Above Grade 12	12	98	1.6(0.04,0.38)	4.3 (0.29,3.12)	0.04*
Income per month					
Low	3	44	1.0	1.0	
Middle	5	50	1.86(1.27,2.71	11.5(0.12,0.81)	0.03*
High	12	42	0.8(0.29,2.15)	2.4(0.27,3.56)	0.53
Very high	9	25	0.3(0.84,0.92)	0.6 (0.04,0.32)	0.01*
knowledge about recommended Physical Activity					
Yes	27	11	1.0	1.0	
No	74	207	0.17(0.08,0.33)	0.2(0.05,0.64)	0.01*
Good Knowledge	37	242	1.0	1.0	
Perceived severity to diabetes and its complications					
Less	15	44	1.0	1.0	
High	37	223	1.05(1.05,1.09)	7.3(0.19,2.80)	0.02*
Perceived barriers to physical activity					
Less	30	276	1.0	1.0	
High	8	5	1.05(1.0,1.1)	0.9 (0.40,8.35)	0.04*
Perceived self-efficacy to engage in physical activity					
Less	0	165	1.0	1.0	
High	38	116	1.13(1.06,1.20)	5.9(0.64,0.96)	0.02*
NB*= significant					

4. Discussion

This study revealed that the educational status of the respondents were significantly associated with the likelihood of engaging in the recommended physical activity practices and the study done in Iranian women showed that education is an important and significantly association with physical activity [15].Also the study done in Harari (Ethiopia) on self-care practice concluded that educational status had significant effect for patients self-care behavior [11, 12].

The mean BMI was 22.8(SD±2.80) and most of them 239(74.9%) were found in normal weight category and only 68(21.3%) of the respondents were obese. In this study the respondents are less obese when compared with the study done in Mexico were the mean body mass index is above the cutoff points for obesity , which might be related to low socio-economic status of the respondents. Further analysis of this study showed that BMI of patients did not have significant statistical influence on physical activity of the patients. It hold true for self care practice study [11].

In this study very few practice the recommended physical activity 38(11.9%) but this differs from study done in USA which were 39% were engaged in the recommended physical activity [16].However the finding of this study is consistent with the previous studies specially in terms of physical self care [11, 12].This might be resulted due to the preference of diabetes patients to other ways of self management behavior like diet and medication rather than engaging in recommended physical activity.

Knowledge is an essential factor for behavior change but it cannot be a sufficient condition to behavior change by its own alone [17]. In this study, general Knowledge of the respondents about diabetes was very high accounting

279(87.5%) ; however, majority of them did not follow the recommended physical activity practice. Similarly, a study conducted in Iran showed that knowledge about diabetes had no significant statistical association with glycemic control [15].

Unlike a study done diabetes clinic in Khoy (Iran) were the income per month which is no significant association with the likelihood of engaging in the recommended physical activity [15]. In this study income was one of the factors that affect physical activity behavior of the diabetes patients attending Jimma University Specialized Hospital. Generally middle income patients are more adherent to physical activity than low income patients; this may be due to patients with middle incomes are governmental employs and have an access to get and read different magazine related to diabetes and they have more probability of knowing the recommended physical activity for diabetes patients. On the other hand high income patients are less adherent to physical activity this might be resulted from individual with high income had riskier life style than low income patients. The finding of this study is consistent witt Similar study done on self-care in Harari (Ethiopia) income of the respondent had a significant association with self care practice of the patients [11].

The perceived barriers of the respondents had showed that people who had less perceived barriers to physical activity were better to perform the recommended physical activity similar study done in Harari(Ethiopia) showed that people who had moderate perceived barriers to self-care were better to perform self-care [11]. In line with assumption of the HBM ,patients who had less perceived severity to the diabetes complication were more adherent to the recommended physical activity and according ,to the model, perceived severity is the strongest predictor to practice[11]; In this study perceived severity had significant association with the likelihood of engaging in the recommended physical activity. In contrast to the assumptions of HBM, perceived susceptibly to diabetes complication and perceived benefit of the recommended physical activity were no significant association. The finding of this study is also similar with the study done in Harari (Ethiopia) which were perceived susceptibility and perceived benefit toward the recommended self-care were no significant association [11].

This study revealed that perceived self-efficacy is the strong predictor of the likelihood of diabetes mellitus type-2 patients to engage in the recommended physical activity. The study in Iran also had similar finding which is perceived self-efficacy is strong predictor of physical activity adherence [15].This resulted due to if patients had confidence/ highly efficacious people are more likely to to persevere in their attempts in performing a recommended behavior in different situations.

It is well known that increasing reach and frequency of appropriate message has an impact on behavior change however finding of this study shows that the frequency of information heard had no significant association with the likelihood of engaging in the recommended physical activity. Other finding in Harari/Ethiopia/ on self-care practices contradicts with this finding which is frequency of information heard had significant association to self care[11] and since the data is collected with the health professional working in the diabetes clinic there may be social desirability bias and socio-demographic variation between the study groups. In this study knowledge about the recommended physical activity had a significant association with the likelihood of engaging in the recommended physical activity. Since the data were collected by health professionals working in follow up clinic there might be social desirability bias. Physical activity were obtained by self-report and may be limited by recall bias.

From this study we can conclude that educational status has a significant effect for patients with diabetes in order to engage in the recommended physical activity. This finding also showed that income of patients has significant statistical effect on the likelihood of engaging in the recommended physical activity. Patients knowledge of recommended physical activity has significant Stastical effect on the likelihood of engaging in the recommended physical activity.

Patients with high perceived severity of the disease were more likely to adhere to physical activity practice , so perceived severity of the disease is helpful for the likely hood adherence of physical activity. High perceived barriers was also one of the obstacles for patients with diabetes physical activity adherence. Patients perceived self-efficacy also another determining factor for diabetes physical activity practices as the study showed that individual with high perceived self efficacy are more likely to adhere in the recommended physical activity.

To increase the engagement of diabetes patients in physical activity ,diabetes messages should focus on severity of diabetes and how to overcome barriers for physical activity and how to build one's self efficacy by segmenting the audiences based on income and educational status by creating awareness on recommended physical activity to be performed per a week including the time.

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Authors' Contributions

AT conceived and designed the study, and analysed the data. LA, GK contributed to the design of the study. All authors contributed to the manuscript and approved its final version submitted for publication.

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