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Original Article

Evaluation of ADL and BMI in the management of diabetes mellitus at secondary and tertiary health facilities

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ABSTRACT

Aims: Physical activities of daily living (ADL) constitutes one of diabetes management options. This study aimed to assess the extent that ADL and BMI are evaluated among diabetes patients in hospital practice.
Method: This was a clinical observational baseline study in two hospitals. Audit of medical files was performed to assess if BMI and occupations were recorded (N = 112). Afterwards, 'N = 38' who consented to participate in prospective study were conveniently sampled to assess ADL in relation to accessible metabolic syndrome tests. A validated questionnaire was used to collect data, which were analysed using SPSS version 20.
Results: Audit shows 55/112 of clients' occupation were taken, of which 31% has BMI record. Those with lipid profile results are without blood pressure and vice versa. In the cross-sectional assessment, 74% are in physically demanding ADL occupations, but affirmed inactivity is 98% on leisure exercise. Further, 47% have BMI >25 kg/m^2 and were consistently less active on all leisure ADL relative to those with BMI <25 kg/m^2 ($p < 0.02$).
Conclusion: This report highlights oversight in clinical practice, whereby accessible metabolic syndrome parameters and occupation of clients living with diabetes are being assessed inconsistently. This implies an unmet need in the integration BMI and occupational information to improve diabetes self-management.

1. Introduction

Diabetes is one of the largest global health emergencies of the 21st century. It is among the top 10 causes of death globally and together with the other three major non-communicable diseases (NCDs) (cardiovascular disease, cancer and respiratory disease) account for over 80% of all premature NCD deaths [1].The International Diabetes Federation (IDF) estimates the global prevalence of diabetes mellitus to be 151 million in 2006, 285 million is 2009, 366 million in 2011, and 425 million people aged 20–79 years are living with diabetes [2].

This dramatic increase in diabetes has occurred in all countries in rural as well as urban areas. Accurate global, regional and country level estimates and projections of diabetes prevalence are necessary for prevention and treatment strategies to be planned and monitored, and to assess progress towards reaching the target set by the global action plan for non-communicable diseases and the sustainable development goals [2,3].

In Delta State of Nigeria, concerted research has been ongoing on [4,5], especially including factors influencing diabetes management such as physical activities [6–8]. It has been established that intensive education is a valid option to improve patient self-management [9]. However, this method has yet to be tried in Nigeria and Delta State in particular.

It is now generally agreed and no longer in dispute that regular physical activities is a necessary part of diabetes management [10]. Physical activities of daily living (ADL) includes all movement that increases energy use and may be simple tasks, unlike leisure exercise that is scheduled and structured [11,12]. However, there are challenges in adoption of physical activities for blood glucose management. For instance, controlling blood glucose level still remain one of the challenges among athletes living with diabetes

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[13]. Indeed, it varies with diabetes type, activity type, and presence of diabetes complications [11]. Hence, physical activity and exercise recommendations are meant to be tailored to suit specific individual needs [14].

Among the challenges to being physically active are socio-demographic, environmental and motivational barriers [15,16]. For instance, occupation and educational status have been implicated in the puzzle [17]. In Nigeria and Delta State in particular, gym and physiotherapy practices are very limited in the cities and non-existent in the rural communities. In this context of physical activity regimen affordance is a factor because availability and cost underpin the choice of what the healthcare practitioner prescribes to a patient to keep fit.

Yet, there are activities that fit into the definition of physical activity by World Health Organization (WHO), which the people undertake on a daily basis vis-à-vis ADL [11,18]. Therefore, it is imperative to establish how such physical ADL could be formulated into a health program. There is the emerging concept of peer-education, which will obviously include physical and health education (PHE). How this has been practiced among diabetes patients as well as by health professionals and public health providers in yet unknown; hence the focus of this research.

1.1. Objectives

- If physical ADL of DM patients is assessed in clinical practice
- Assess the influence of diabetes on the ADL of the respondents
- Determine the level of physical activities of the respondents
- Evaluate the body mass index (BMI) of the respondents; and determine whether any ADL item is significantly different between BMI groups

2. Methods

Ethical consideration: Approvals were obtained from Ndokwa-West local government and from management of EBGH for ongoing work at the facilities. Also, ethical clearance from Novena University, as well as letter of introduction from the department of Public and Community Health, was obtained/forwarded to the various healthcare facilities.

Research Design: This study was a clinical observational baseline study with convenience sampling of diabetes patients. This was a descriptive study and according to the method of recent report from Croatia [19]. Hospital records of diabetes patients were audited and collected from two hospitals (secondary and tertiary health facilities) in Delta State.

1. Secondary facility: Catholic Hospital, Abbi (CHA)
2. Tertiary facility: Eku Baptist Government Hospital (EBGH)

Subjects/Sampling: Existing medical records of diabetes patients who attended the medical facilities within the period of March–October 2018 were obtained. *Convenience sampling technique was adopted as selection was based on characteristics of invitees being known and managed for diabetes or prediabetes patients.*

The number of clinical case files audited were 112; comprising 42 from CHA and 70 from EBGH. The 42 from CHA particularly attended and were identified during a dedicated screening event which took place in the month of March 2018. At EBGH, 54 out of the 70 case files were identified and invited. A total of 'N = 38' respondents (23/42 from CHA and 15/54 from EBGH) consented and attended the clinics for the administration of questionnaire.

Inclusion/Exclusion Criteria: Inclusion criteria were being registered at one of the two health facilities, diagnosis of diabetes and/or prediabetes, consent on invitation and attendance to the health facility for the baseline characteristics survey. Those excluded were non-diabetes patients, deceased diabetes patients and non-consenting and/or non-attendance on invitation to the facilities.

Sample Size consideration: This work was preparatory to a clinical trial that purposed to involve 180 participants and the prevalence of diabetes being about 5.5% [5]. Discretional effort was to achieve up to 'N = 200'; so that 2.5th – 97.5th percentile (i.e. 95% central range) for the purposed description >180. However, this number was not achieved; hence the parallel studies developed at other health facilities.

Research Instruments and questionnaire administration: First, diabetes register form was developed from Australian proforma at CHA in September 2017. Clinical cases form (questionnaire per se) was used to collect anthropometric and socio-demographics profile as per standard methods [20]; and other medical history as previously done in the ongoing study [7]. Nouri & Lincoln form was used to evaluate activities of daily living [21]. This was a collaborative research. All collaborating team members were involved in administration of the questionnaire, and supporting participants to complete when requested.

Data collection: Information necessary for inclusion in diabetes register were recorded. Patients were further invited and questionnaire administered. Clinical and demographics information as well as other information of patients were recorded. The height and weight obtained were used to calculate the Body Mass Index of the respondents using the formula BMI= Weight (Kg)/Height (m^2). Body-mass index categories were defined using the WHO cut points in units of kg/m^2, normal weight = 18.5 kg/m^2 - < 25 kg/m^2, overweight = 25 kg/m^2 - < 30 kg/m^2 and obese ≥30 kg/m^2.

Data Analysis: The collected data was entered into the computer and analysed using both Excel analysis Tool Pak version 2013 and SPSS version 20. The analysed data was presented in frequency, percentages and charts. First, audit of case files were performed to determine proportion of information necessary for diabetes register that are available on the records. The participants were distributed into dichotomous physically active vs. inactive for evaluation of levels of diabetes-impaired ADL and leisure exercise. Thirdly, participants were regrouped according to BMI diagnostic categories for evaluation of difference in ADL.

3. Results

The audit of records (N = 112) show that only 55 has record of their occupation. Among the 55, those with BMI and lipid profiles are 31% and 25% respectively; including 22% that has both clinical measurements (Table 1). Measurement of waist circumference was not collected on any of the patients.

3.1. Socio-demographic characteristics of the respondents

According to Table 2 below, more than 34% of the respondents are 37 years old or less. Among the 34 that indicated awareness of co-morbidity, only 13 were able to mention other co-morbidities. Notably, 1/13 indicated obesity (Table 2). Furthermore, dichotomous distributions show more than two-third (28/38) of the

Table 1
Proportions of data collected for possible evaluation of occupational ADL.

Variable	N/55	% Proportion
Body mass index	5	9.1%
Lipid profile	2	3.6%
BMI &lipid profile	12	21.8%
No BMI or lipid profile	36	65.5%

Table 2
Socio-Demographic characteristics of the respondents.

Variable	Stratification	Frequency
Age	18–27	8
	28–37	5
	38–47	9
	48–57	9
	58–67	4
	68–77	3
Highest level of Education	Primary	10
	Secondary	14
	University/Polytechnic	12
	Postgraduate	2
Occupation	Student	3
	Civil Servant	4
	Artisan	13
	Health Worker	2
	Business	12
	Pastor	1
	Farmer	3
Co-morbidity awareness	Yes	34
	No	4
Indicated disease conditions (n = 34)	Diabetes mellitus, only	21
	High Blood Pressure	9
	High Cholesterol	1
	Obesity	1
	Kidney Disease	1
	Heart Disease	1

respondents had employed jobs that could be classified as white collar jobs.

Evaluations of the level of impairment on ADL due to living with diabetes show that different proportions have their ADL items impacted. For instance, that less than one third of the respondents 12/38 affirmed that been diabetic have not interfered with their ability to go to work, while half (19/39) indicated have their ability to ride bicycle unaffected. Dichotomous classification of the effects into 'Active' (those who are affected slightly or not at all) and 'Inactive' (those who have affected moderately or more) show on average, a significantly lower proportion (42%) of the participants are inactive (Fig. 1; $p < 0.02$).

3.2. Physical activities

When leisure exercise i.e. purposive physical activities were evaluated, result show that approximately 95% of the participants are not engaging in swimming. While only about 92% do engage in riding bicycle, none (0/38) do ride for more than 3 h per week. Other leisure activities are partaken at different degrees as presented (Table 3). Further, classification of participants into active versus inactive show 5.3% active in stretching, and 2.6% in walking exercises. None is actively engaging in swimming or bicycling.

On evaluation of obesity, the mean weight of the respondents was 70 ± 15 kg while the mean BMI was 25.3 ± 6.6 kg/m^2. Classification of the participants into diagnostic BMI ranges shows 15.8% underweight and 36.8% were of normal, while 23.7% are overweight and another 23.7% in obese category. When participants are first distributed into dichotomous BMI groups for differences in leisure exercise ADL, results show that the group 'BMI≤25' are consistently more active relative to "BMI>25" group (Fig. 2). Further, when the four BMI groups based on diagnostic range were compared for differences in leisure exercise ADL, multivariate analysis showed statistical significance, especially for bicycle riding and 'others' (MANOVA: $p < 0.01$), with the normal BMI group being most significantly active.

4. Discussion

The study sought to assess ADL and the engagement in physical activity among diagnosed diabetes patients in two hospitals within Delta State. The findings of the study would be discussed with a view to make evidence-based recommendations on how to improve the level of assessment of ADL in the management of diabetes including integration into self-management.

The result of records' audit shows approximately half (49%) of audited case files have information about the patients' occupation. In other words, 51% of patients have not been assessed for their occupation (Table 1). This implies oversight of occupational therapy aspect in the patients' management. It is known that occupational physical activities is therapeutic in diabetes management [22], and constitutes a potential self-management regimen [23]. Indeed, an anecdotal case has been reported whereby a newly diagnosed

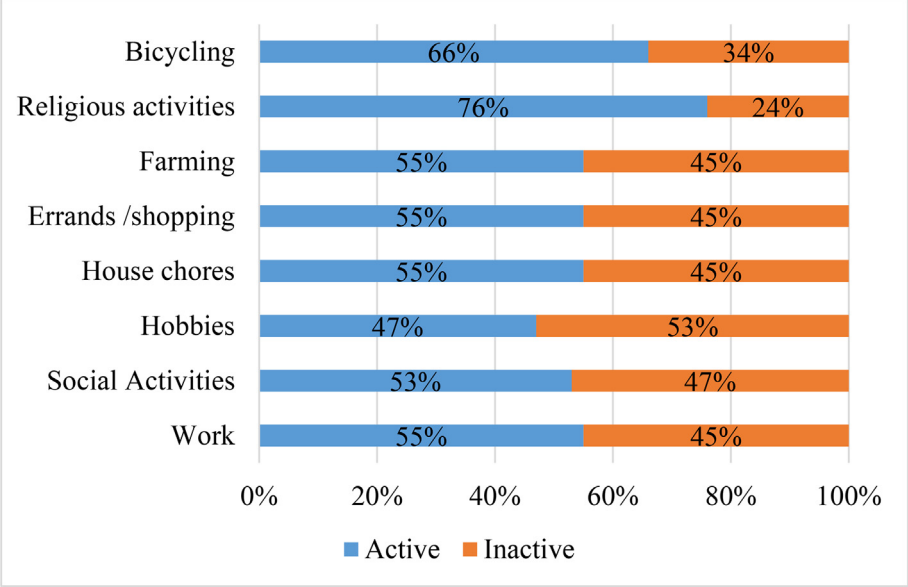

Fig. 1. Dichotomous distribution of respondents based on physical ADL.

Table 3
Level of leisure exercise activities of the respondents per week.

	None	<30min	30–60min	1-3Hrs	>3Hrs
Stretching or strengthening	21	7	6	2	2
Walk for exercise	11	9	13	4	1
Swimming	36	1	0	1	0
Bicycle	3	4	3	28	0
Other physical & health activities	27	8	2	0	1

$P < 0.01$.

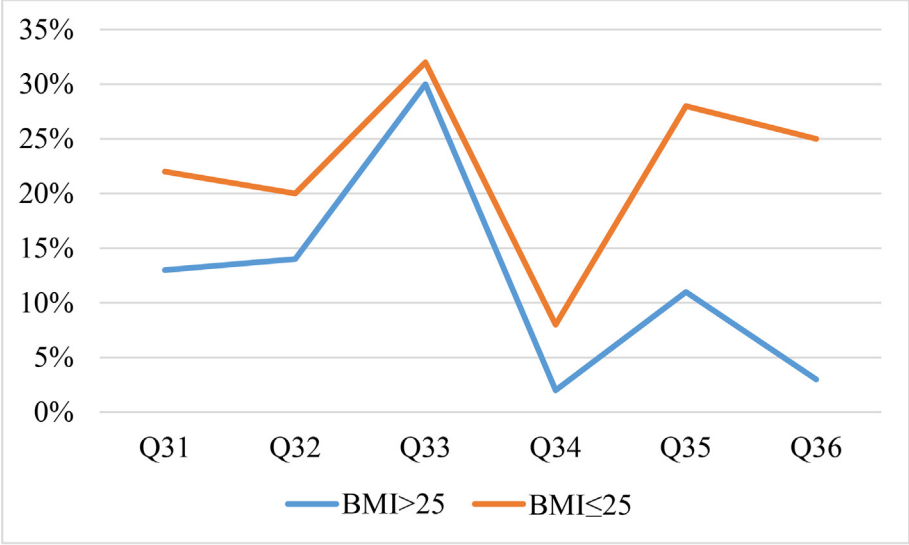

Fig. 2. Percentage activities in BMI groups ($p < 0.01$).

diabetes client was counselled to"go to his farm as a form of exercise and occupational therapy as opposed to obligation to alleviate financial pressures" [24]. What this paper reports is that medical practice of documenting patients' occupational background with a view to evaluate and integrate in self-management needs to be emphasized.

It is also noted that among the 55/112 whose occupation were documented, only 22% have data for both BMI and lipid profile; while 65.5% have neither of the cardiometabolic indices assessed. The implication is that majority of the occupational history are yet to be appropriately integrated into management. For instance, 5/14 of the lipid profile records indicate dyslipidaemia co-morbidity. It is known that physical activity is necessary to combine with statin therapy, though with potential side-effects that requires management [25–27]. Also, obesity is influenced occupation [17], but unfortunately poorly assessed in public health facilities [28]. What this report contributes is epidemiological data that over.

- 50% of cases may be completely missing out on evaluation of their occupational physical activity status
- 65% of those with occupation's records are without BMI or lipid profile; hence constitute unmet needs in diabetes care.

In the previous report on association of physical activity with metabolic syndrome, an overall prevalence of physically active individuals was 50% [7]. Based on the difference between rural and urban dwellers, it was noted that physical inactivity appear more prevalent in the urban areas and that interventions solely targeted at physical activities may be insufficient. A study report from Nepal has also indicated high level of physical activity among the participants and attributed transport mode plus occupation as the major determinants of physical activities [16].

The significant contribution of this discourse lies in a minimum of two facts. Firstly, collection of occupational physical activity is part of taking history and incurs no additional cost to the healthcare provider or client. Secondly, integration of a patient's occupation ADL into care plan that would lead to development of self-management [22], and reduction in medical care costs e.g. as may be attributable to self-management or family support [29]. This is very relevant to the LMIC where "diabetic patients face significant challenges accessing diagnosis and treatment, which contributes to the high mortality and prevalence of complications observed" [30].

Among the 38 participants in the cross-sectional evaluation, the age of the respondents shows that most of the respondents were between ages 18–57 years (Table 2). In particular, 34% of the respondents are 37 years old or less, which is well below the recommended 40 or 45 years of age for diabetes screening [31,32]. This is the adult age of an individual and the productive age of the working class. The implication is considerable economic burden of the disease being probably underestimated [29], especially considering that DM has been shown to result in economic loss based on lost productive hour in nations such as Nigeria with high prevalence of the disease [2].

There are approximately 26% of the participants grouped into the sedentary occupation. Some of the civil servants and healthcare professionals could be doing high occupational activity e.g. bedside nurses and maintenance engineers. The difficulty is separating these white collar job individuals from their sedentary roles

epitomizes the complexity of ADL as a sole measure of physical activity/fitness [17]. Further, the level of education shows most of the respondents were educated. However, when asked if they are aware of having any disease condition, majority knew they had a disease while few do not know if they have any disease. It is known that educational level alone does not translate to health literacy [33]. Yet, health literacy is related to motivation for diabetes self-management actions [34].

Almost one-third affirmed that being diabetic have not stopped them from going to work. However, 68.5% of respondents indicated that the disease has hindered at varying degrees (Fig. 1). Thus, it can be deduced that the impact of the disease has been felt by the respondents. The finding of the study is in agreement with several reports, which highlight the negative association between diabetes and employment outcomes [35–37].

Furthermore, many of the respondents agreed that being diabetic has not interfered with their normal physical ADL; and dichotomous distribution of the participants show a minimum of 24% and maximum of 53% being classified as inactive in religion and hobbies, respectively. This is important in diabetes self-management, especially in Nigeria rural communities were family bond is valued. The finding is in line with the finding from a Dutch General Practice that individuals living with diabetes are about 2.5 times more likely to suffer impairment in their functional ADL relative to apparently healthy control [38]. The study in Nepal considered busy schedules and family commitment as barriers [16]. In this study, house chores have been counted as ADL as recommended [21,22]. In addition, the observation reported here is similar to the findings in other reports that showed a correlation between religiosity and glycaemic control [39,40].

The results of the study shows that engagement in leisure exercise activities are poor with 95%, and 55% not engaged in swimming and stretching respectively (Table 3). 92% and 72% of the participants indicate to engage in bicycle riding and leisure exercise walking, but only 0% (zero) and 2.6% affirmed to do it for more than 3-h per week. Thus, dichotomous distribution participants into physically active and inactive groups reveal that more people albeit abysmal 5.3% are actively engaged in stretching, and 2.6% in walking exercises. This might be dangerous for the respondents as lack of exercises are associated with increased risk of complications, hence physical activities now constitute part of lifestyle self-management [9–11]. However, it is noteworthy that swimming is not a popular exercise in Nigeria and rural communities cannot boast of recreational parks. The implication is that tailored physical activity options may need to be developed [14].

In one of the previous reports, BMI was indicated to be inferior to waist circumference and waist-to-height ratio in predicting diabetes and metabolic syndrome, respectively [41]. Nevertheless, BMI has been used in this study, because it is the available measure employed in practice. Importantly, effort was made to avoid digressing into the metabolic syndrome concept, but emphasize the need for ADL and weight loss [42]. In this study, evaluation of BMI shows average being in the lower end of overweight, while there is 15.8% classifiable as anorexic, equal proportions of 23.7% were overweight and obese. Multivariate analysis show significant difference in indicated leisure exercise activities between the BMI groups ($p < 0.01$). Those in the normal BMI group are more engaged on leisure exercises, especially in bicycle riding and other activities. Further, evaluation comparing the dichotomous 'BMI$\leq$25' versus 'BMI>25' group show consistent more engagement by the former relative to the overweight/obese on all the leisure exercises (Fig. 2).

It can be inferred that weight or obesity is impacting negatively on the participants. In a previous report, it was indicated that except for those with normal BMI, more people in the other categories were physically inactive [7]. This report, which has been focused on individuals living with diabetes, affirms that abnormal BMI negatively impacts on physical activity. It had been long established that physical inactivity is risk factor in diabetes management and there is optimism about benefits with interventions [43,44]. It is known that weight is barrier to leisure exercise, though weight-control intentions may be motivating [15]. It is also known that barriers to achieving optimal diabetes self-management comprise knowledge, attitude and practice including factors such as good quality health care [45]. What this report brings to the fore is that assessment of ADL and BMI has yet to be a compulsory or consistent routine protocol in medical practice. Therefore, evaluation and monitoring of metabolic syndrome is apparently an unmet need in diabetes self-management.

In this study, only one person (2.6%) indicated awareness of being obese (Table 2), whereas 23.7% are in the category. Therefore, there are 21.1% of the participants who are obese, but unaware hence probably no intention/motivation to engage in leisure physical activity. The importance of this observation lies in the proportion of patients who need health education and training to embark on weight control. Another importance relates to previous expression regarding clinical practice that data needs to be collected in order to more adequately address the unmet needs of patient care, especially regarding using accessible medical information to manage metabolic syndrome and BMI in particular.

5. Conclusion

This report advances the need for integration of physical ADL in diabetes care. It highlights the level of omission in medical assessment that translates to unmet need of metabolic syndrome management among known diabetes patients. There is necessity for health practices to collect patients' occupation details as well as anthropometrical data in order to integrate occupational information and physical activity regimen in diabetes care. The study affirms that having diabetes interferes to some extent with participants' ADL including basic and leisure exercise activities. Exercise regimen should be tailored to the available physical activities of the community, especially to seriously take advantage of stretching and walking exercises up to the internationally recommended 30 min/day and minimum five days/week. Healthcare professionals would need to necessarily assess both ADL and BMI of their patients' affordable and preferred type of leisure physical activities in order to engage person-centred care.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.dsx.2019.05.033.

References

[1] DeFronzo RA, Abdul-Ghani M. Assessment and treatment of cardiovascular risk in prediabetes: impaired glucose tolerance and impaired fasting glucose. Am J Cardiol 2011;108:3B–24B.
[2] International Diabetes Federation. IDF diabetes atlas. eighth ed. Brussels, Belgium: International Diabetes Federation; 2017 [23rd Aug]. Available from:

http://www.diabetesatlas.org/resources/2017-atlas.html.
[3] International Diabetes Federation Guideline Development Group. Global guideline for type 2 diabetes. Diabetes Res Clin Pract 2014;104:1–52.
[4] Oguoma VM, Nwose EU, Skinner TC, Richards RS, Digban KA, Onyia IC, et al. Anthropometric indices: how they compare in screening of cardio- metabolic risks in a Nigerian sub-population. Afr J Med Med Sci 2016;45:91–8.
[5] Nwose EU, Richards RS, Bwititi PT, Igumbor EO, Oshionwu EJ, Okolie K, et al. Prediabetes and cardiovascular complications study (PACCS): international collaboration 4 years' summary and future direction. BMC Res Notes 2017;10:730. https://doi.org/10.1186/s13104-017-3017-7.
[6] Nwose EU, Digban KA, Oshionwu EJ, Onyia IC, Bwititi PT, Oguoma VM, et al. Cardiovascular risk screening options in diabetes: framework for selective adoption. Natl J Community Med 2016;7:540–4.
[7] Oguoma VM, Nwose EU, Skinner TC, Richards RS, Digban KA, Onyia IC. Association of physical activity with metabolic syndrome in a predominantly rural Nigerian population. Diabetes Metab Syndr 2016;10:13–8.
[8] Nwose EU, Igumbor EO, Ojugbelie C, Bwititi PT, Richards RS. Evaluation of inter-current illness intervening lifestyle in stratified age groups: focus on diabetes and its cardiovascular complication. Int J Health Rehabil Sci 2018;7:116–30.
[9] Khunti K, Gray LJ, Skinner T, Carey ME, Realf K, Dallosso H, et al. Effectiveness of a diabetes education and self management programme (DESMOND) for people with newly diagnosed type 2 diabetes mellitus: three year follow-up of a cluster randomised controlled trial in primary care. BMJ 2012;344:e2333.
[10] International Diabetes Federation. The diabetes education modules 2011 [25th Oct, 2018]. Available from: https://d-net.idf.org/en/library/178-diabetes-education-modules-2011.html.
[11] Colberg SR, Sigal RJ, Yardley JE, Riddell MC, Dunstan DW, Dempsey PC, et al. Physical activity/exercise and diabetes: a position statement of the American Diabetes Association. Diabetes Care 2016;39:2065–79.
[12] Fokkenrood HJ, Bendermacher BL, Lauret GJ, Willigendael EM, Prins MH, Teijink JA. Supervised exercise therapy versus non-supervised exercise therapy for intermittent claudication. Cochrane Database Syst Rev 2013:Cd005263.
[13] Yardley JE, Colberg SR. Update on management of type 1 diabetes and type 2 diabetes in athletes. Curr Sports Med Rep 2017;16:38–44.
[14] Chodzko-Zajko WJ, Resnick B, Ory MG. Beyond screening: tailoring physical activity options with the EASY tool. Transl Behav Med 2012;2:244–8.
[15] Santos I, Ball K, Crawford D, Teixeira PJ. Motivation and barriers for leisure-time physical activity in socioeconomically disadvantaged women. PLoS One 2016;11:e0147735.
[16] Kadariya S, Aro AR. Barriers and facilitators to physical activity among urban residents with diabetes in Nepal. PLoS One 2018;13:e0199329.
[17] Barlin H, Mercan M. Occupation and obesity: effect of working hours on obesity by occupation groups. Applied Economics and Finance 2016;3:179–85. https://doi.org/10.11114/aef.v3i2.1351.
[18] World Health Organization. The WHO STEPwise instrument for non-communicable disease risk factor surveillance. World Health Organization; 2017. Available from: http://www.who.int/chp/steps/manual/en/.
[19] Vince K, Poljičanin T, Brkić M, Rodin U, Matijević R. Prevalence of diabetes five years after having gestational diabetes during pregnancy - Croatian national study. Prim Care Diabetes 2018;12:325–30.
[20] Hasenegger V, Rust P, König J, Purtscher AE, Erler J, Ekmekcioglu C. Main sources, socio-demographic and anthropometric correlates of salt intake in Austria. Nutrients 2018;10:311. https://doi.org/10.3390/nu10030311.
[21] Nouri FM, Lincoln NB. An extended activities of daily living scale for stroke patients. Clin Rehabil 1987;1:301–5. https://doi.org/10.1177/026921558700100409.
[22] Atler KE, Schmid AA, Klinedinst TC, Grimm LA, Marchant TP, Marchant DR, et al. The relationship between quality of life, activity and participation among people with type 2 diabetes mellitus. Occup Ther Health Care 2018;32:341–62.
[23] O'Toole L, Connolly D, Smith S. Impact of an occupation-based self-management programme on chronic disease management. Aust Occup Ther J 2013;60:30–8.
[24] Nwose EU, Bwititi PT. Bio-psycho-sociocultural basis of diabetes rehabilitation: case report with implications for cultural competence and physiotherapy. Int J Health Rehabil Sci 2016;5:172–82.
[25] Bosomworth NJ. Statin therapy as primary prevention in exercising adults: best evidence for avoiding myalgia. J Am Board Fam Med 2016;29:727–40.
[26] Noyes AM, Thompson PD. The effects of statins on exercise and physical activity. J Clin Lipidol 2017;11:1134–44.
[27] Deichmann RE, Lavie CJ, Asher T, DiNicolantonio JJ, O'Keefe JH, Thompson PD. The interaction between statins and exercise: mechanisms and strategies to counter the musculoskeletal side effects of this combination therapy. Ochsner J 2015;15:429–37.
[28] Dixon JB. The effect of obesity on health outcomes. Mol Cell Endocrinol 2010;316:104–8.
[29] Hogan P, Dall T, Nikolov P. Economic costs of diabetes in the US in 2002. Diabetes Care 2003;26:917–32.
[30] Hall V, Thomsen RW, Henriksen O, Lohse N. Diabetes in Sub Saharan Africa 1999-2011: epidemiology and public health implications. A systematic review. BMC Public Health 2011;11:564.
[31] Pippitt K, Li M, Gurgle HE. Diabetes mellitus: screening and diagnosis. Am Fam Physician 2016;93:103–9.
[32] American Diabetes Association. 2. Classification and diagnosis of diabetes: standards of medical care in diabetes-2018. Diabetes Care 2018;41:S13–27.
[33] Masood I, Saleem A, Hassan A, Umm EK, Zia A, Khan AT. Evaluation of diabetes awareness among general population of Bahawalpur, Pakistan. Prim Care Diabetes 2016;10:3–9.
[34] Powell CK, Hill EG, Clancy DE. The relationship between health literacy and diabetes knowledge and readiness to take health actions. Diabetes Educat 2007;33:144–51.
[35] Tunceli K, Bradley CJ, Nerenz D, Williams LK, Pladevall M, Elston Lafata J. The impact of diabetes on employment and work productivity. Diabetes Care 2005;28:2662–7.
[36] Kahn ME. Health and labor market performance: the case of diabetes. J Labor Econ 1998;16:878–99.
[37] Bastida E, Pagan JA. The impact of diabetes on adult employment and earnings of Mexican Americans: findings from a community based study. Health Econ 2002;11:403–13.
[38] de Grauw WJ, van de Lisdonk EH, Behr RR, van Gerwen WH, van den Hoogen HJ, van Weel C. The impact of type 2 diabetes mellitus on daily functioning. Fam Pract 1999;16:133–9.
[39] How CB, Ming KE, Chin CY. Does religious affiliation influence glycaemic control in primary care patients with type 2 diabetes mellitus? Ment Health Fam Med 2011;8:21–8.
[40] Fincham FD, Seibert GS, May RW, Wilson CM, Lister ZD. Religious coping and glycemic control in couples with type 2 diabetes. J Marital Fam Ther 2018;44:138–49.
[41] Oguoma VM, Nwose EU, Ulasi II , Akintunde AA, Chukwukelu EE, Araoye MA, et al. Maximum accuracy obesity indices for screening metabolic syndrome in Nigeria: a consolidated analysis of four cross-sectional studies. Diabetes Metab Syndr 2016;10:121–7.
[42] Psaty BM, Lumley T, Furberg CD. The metabolic syndrome: time for a critical appraisal: joint statement from the American Diabetes Association and the European Association for the Study of Diabetes: response to Kahn et al. Diabetes Care 2006;29:177. author reply -8.
[43] Ramaiya KL, Swai AB, McLarty DG, Alberti KG. Impaired glucose tolerance and diabetes mellitus in Hindu Indian immigrants in Dar es Salaam. Diabet Med 1991;8:738–44.
[44] Lee SF, Pei D, Chi MJ, Jeng C. An investigation and comparison of the effectiveness of different exercise programmes in improving glucose metabolism and pancreatic beta cell function of type 2 diabetes patients. Int J Clin Pract 2015;69:1159–70.
[45] Ahola AJ, Groop PH. Barriers to self-management of diabetes. Diabet Med 2013;30:413–20.