

Prevalence of Pre-Diabetes and its Associated Risk Factors Among Nile College Students, Sudan

Mamoun Magzoub ^{1*}, Mustafa Awad Elseed Elkhawad ², Duaa Tagelser Ahmed ³, Abubakr Shehabeldin Sidig ⁴, Elhady Elaagib Elmubarak ⁵, Sheroug Mahmoud Fahal ⁶, Khalida Khalid Khidir ⁷, Abdel Latif Khalifa Elnaim ⁸

¹ Department of Microbiology & Parasitology, Faculty of Medicine & Health Science, University of Kassala, Kassala, Sudan.

² Arar Cardiac Center, Arar, Saudi Arabia.

³ Nile College, Khartoum North, Sudan.

⁴ Dr Sulaiman Al-Habib Hospital, Jeddah, Saudi Arabia.

⁵ Department of Basic Medical Sciences, College of Medicine, King Saud Bin Abdulaziz University for Health Sciences, Riyadh, Kingdom of Saudi Arabia.

⁶ Ministry of Health, Khartoum State, Sudan.

⁷ Ministry of Health, Kassala State, Sudan.

⁸ Department of Surgery, Kassala Police Hospital, Kassala, Sudan.

***Corresponding Author:** Mamoun Magzoub, Associate Professor, Department of Microbiology & Parasitology, Faculty of Medicine & Health Science, University of Kassala, Kassala, Sudan.

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Abstract

Background: Prediabetes is a condition characterized by elevated blood glucose levels below the threshold for diabetes diagnosis but associated with an increased risk of progression to type 2 diabetes and related complications. The aim of this study is to demonstrate prevalence of prediabetes and its associated risk factors among Nile College Students, Sudan.

Materials and Methods: This observational, descriptive, cross-sectional study was conducted at Nile College, Khartoum North, Sudan, involving 303 students aged 16–30 years from all programs. Participants completed a structured questionnaire covering personal data, medical history, lifestyle factors, and family history. Fasting blood glucose (FBG) was measured, and body mass index (BMI) was calculated. Data were analyzed using SPSS version 22.

Results: Among the 303 participants, 66.3% were female, and 33.7% were male. The overall prevalence of prediabetes was 35.6. The most significant risk factors for prediabetes were a family history of diabetes (88%), elevated BMI, and a sedentary lifestyle. Approximately 39.5% of prediabetic students reported insufficient fruit and vegetable intake, while 10% were smokers.

Conclusion: The high prevalence of prediabetes among Nile College students underscores the need for early screening, lifestyle interventions, and increased awareness to prevent progression to type 2 diabetes. Addressing modifiable risk factors, such as diet and physical activity, is essential for effective management and prevention.

Key Words: prevalence; pre-diabetes; Nile college; Sudan

Introduction

Diabetes mellitus (DM) is a significant global health issue, often undiagnosed until complications arise [1]. Type 2 diabetes mellitus (T2DM) is linked to increased risks of cardiovascular disease (CVD) and

microvascular complications, which can begin before diagnosis, making early detection vital [2]. Prediabetes is a condition characterized by elevated blood glucose levels below the threshold for a diagnosis of

diabetes but associated with a higher risk of developing diabetes. Impaired glucose tolerance (IGT) (2-h glucose 7.8–11.0 mmol/L [140–199 mg/dL]) and impaired fasting glucose (IFG) (fasting glucose 6.1–6.9 mmol/L [110–125 mg/dL]), based on the World Health Organization (WHO) criteria, are commonly used to define prediabetes [3]. People with prediabetes are defined by the presence of impaired fasting glucose (IFG) and/or impaired glucose tolerance (IGT) [4]. According to WHO, diabetes is diagnosed with fasting plasma glucose (FPG) \geq 126 mg/dL, 2-hour post-load glucose \geq 200 mg/dL, or HbA1c \geq 6.5% [5]. In the U.S., 33.9% of adults have prediabetes, with higher prevalence among those aged \geq 65 years, though only 11.6% are aware of their condition [6]. Premenopausal women face growing rates of prediabetes and cardiovascular risks, emphasizing the need for early screening [7]. Similarly, youth with obesity and risk factors should undergo dysglycemia screening [8]. Prediabetes often coexists with conditions like obstructive sleep apnea, amplifying cardiovascular mortality risk [9]. Studies show diverse prevalence rates globally, such as 18.7% among young Saudi females (ADA criteria) [10], 14.4% in Pakistan [12], and significant overlap with tuberculosis in India [11]. In France, while rates are declining, about 25% of diabetes cases remain undiagnosed [13]. The coexistence of prediabetes and prehypertension signals a rising noncommunicable disease burden [14]. Addressing prediabetes through early intervention is key to reducing its progression and associated complications [15]. The aim of this study is to demonstrate prevalence of prediabetes and its associated risk factors among Nile College Students, Sudan.

Materials and Methods

An observational, descriptive, cross-sectional study was conducted at Nile College, Khartoum North, Sudan, during 1 May till 31 July 2015. All students provided informed consent, and their socio-demographic and clinical data (weight, height and diabetes history) were collected using standard questionnaires [22]. Blood samples were collected from students enrolled in all academic programs, including Medicine, Dentistry, Pharmacy, Medical Laboratory Science, Nursing, Computer Information Systems, Business Administration, Accounting and Finance, and the Medical Information Systems Diploma Program. The study included 303 male and female students aged 16 to 30 years, representing all nationalities and academic programs. Students with a known history of diabetes were excluded. A total of 350 blood samples were initially

collected, but 47 samples were excluded due to missing key data, resulting in a final sample covering 20% of the total student population (1,800 students) across the eight programs. The sample included 120 students from the Bachelor of Medicine and Surgery (MBBS) program and proportional representation from other programs. Stratified simple random sampling ensured representation from all programs. Based on the World Health Organization (WHO) criteria, impaired fasting glucose (IFG) (fasting glucose 6.1–6.9 mmol/L [110–125 mg/dL]), were considered prediabetic [3].

Results

Three hundred and three of Nile College students completed the study questionnaire. Regarding fasting blood glucose levels, 64.4% of the participants were normoglycemic, while 35.6% were pre-diabetic, so the prevalence of pre-diabetes was 35.6% (Table 1). The student population comprised 40% studying medicine and 60% enrolled in other programs (Figure 1). Females made up 66.3% of the participants, while males accounted for 33.7% (Figure 2). Nearly 57% of the students were between 19 and 21 years old, followed by 21.5% aged 16–18 years, 19.1% aged 22–24 years, 2.3% aged 25–27 years, and only 0.3% aged 28–30 years (Figure 3). Body Mass Index (BMI) measurements revealed that 57.1% of participants had a normal BMI (18.5–24.9), 21.1% were overweight (BMI 25.0–29.9), and 16.8% were obese (BMI 30.0–34.9). A small percentage, 5%, had a BMI below 18.4, classifying them as underweight (Figure 4). 88.1% of participants reported having a family history of diabetes, with 40% of those cases attributed to their fathers (Table 2). Socioeconomic status was predominantly moderate, with 80% of participants belonging to this group, while 15% were categorized as high socioeconomic status, and 5% as low. Lifestyle habits showed that 12% of the participants were smokers. In terms of dietary and lifestyle patterns, 10% of pre-diabetics were smokers. 35% did not engage in regular physical exercise. Additionally, 39.5% of participants who consumed fruits and vegetables less than three times per week were pre-diabetic. Significant correlations were observed between BMI and fasting blood glucose levels, as well as between marital status and fasting blood glucose levels, with p-values of 0.000 and 0.009, respectively (Table 3, Figure 5). These results underscore the high prevalence of pre-diabetes among the student population and highlight the critical role of lifestyle factors such as physical activity, diet, and BMI in influencing blood glucose levels.

Fasting Blood Glucose	Frequency	Percent
Normoglycemic (Less than 5.6 mmol/L)	195	64.4
Pre-diabetic (5.6 - 6.9 mmol/L)	108	35.6
Total	303	100.0

Table 1: Fasting Blood Glucose among all participants (N=303)

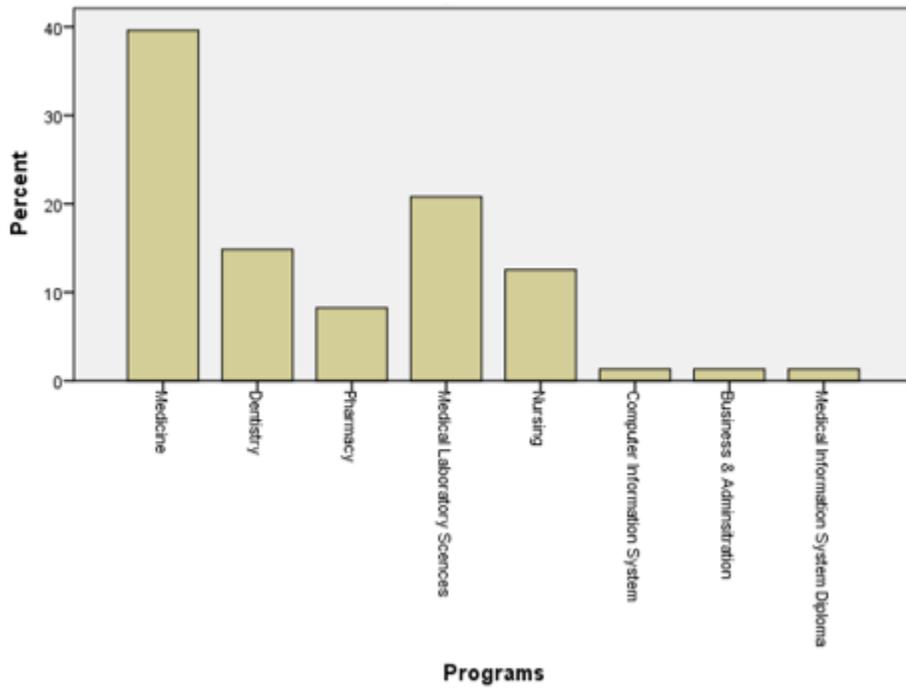


Figure 1: Participants in all programs (N=303)

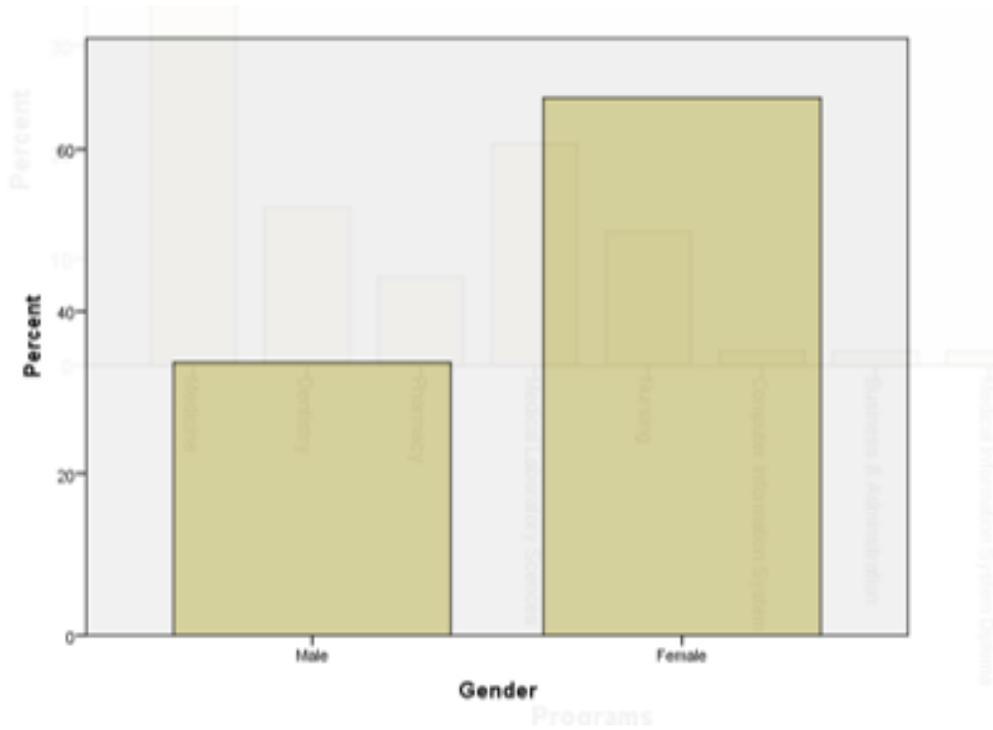


Figure 2: Gender among all participants (N=303)

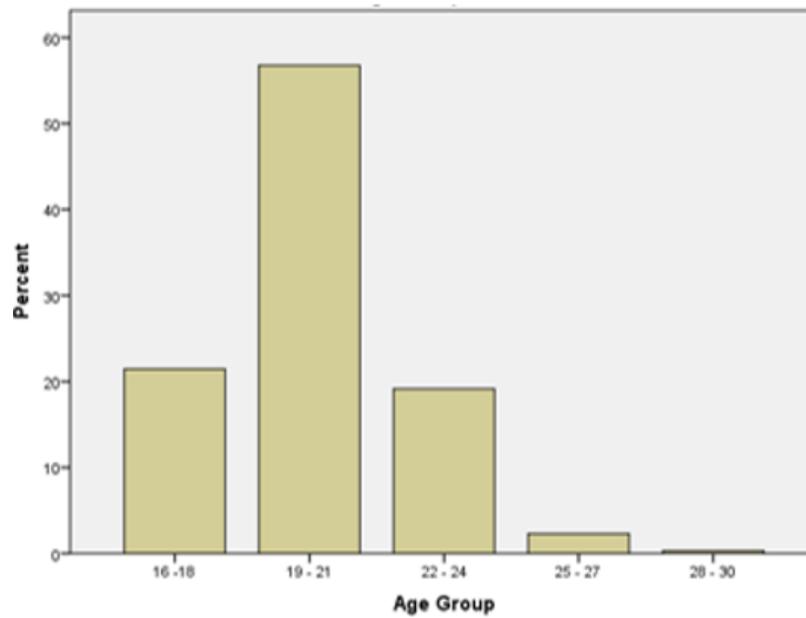


Figure 3: Age Group among all participants (N=303)

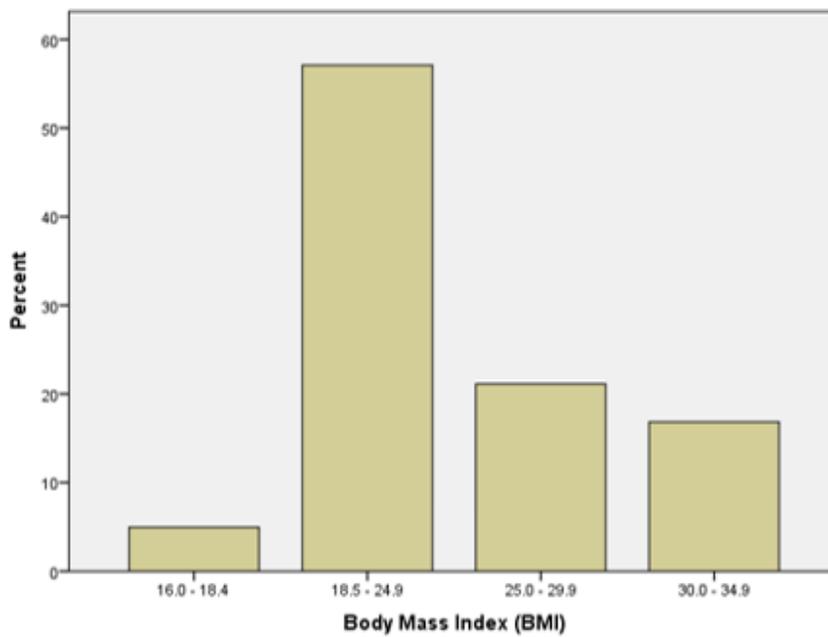


Figure 4: Body Mass Index among all participants (N=303)

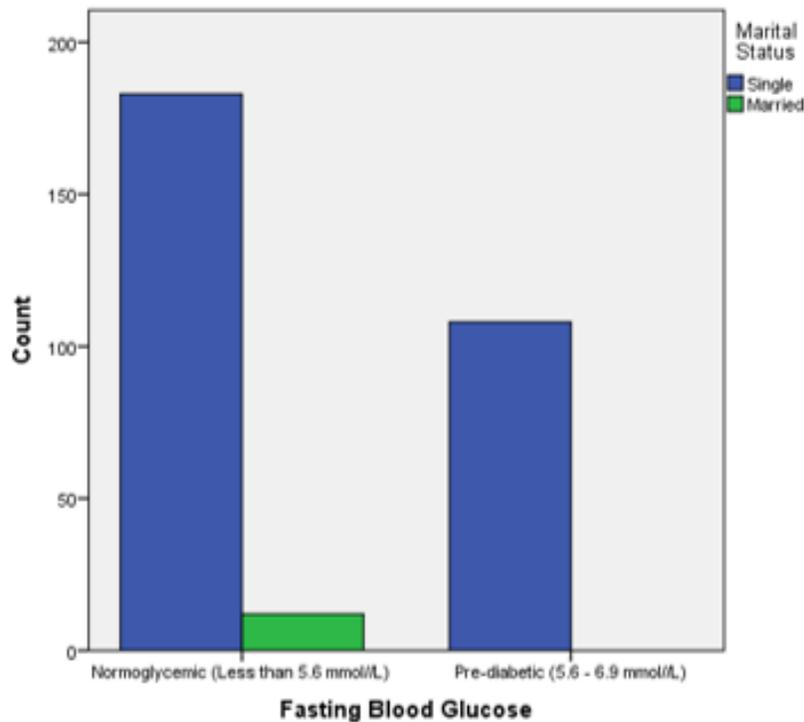
Family History of Diabetes	Frequency	Percent
Yes	267	88.1
No	36	11.9
Total	303	100.0

Table 2: Family History of Diabetes of all participants (N=303)

		Body Mass Index (BMI)				Total
		16.0 - 18.4	18.5 - 24.9	25.0 - 29.9	30.0 - 34.9	
Fasting Blood Glucose	Normoglycemic (Less than 5.6 mmol/ /L)	15	163	16	1	195
	Pre-diabetic (5.6 - 6.9 mmol/ /L)	0	10	48	50	108
Total		15	173	64	51	303

P value = 0.000

Table 3: Fasting Blood Glucose and body mass index BMI) of all participants (N=303)



P value = 0.009

Figure 5: Fasting Blood Glucose and marital status of all participants (N=303)

Discussion

According to our knowledge, this study is the first to investigate the prevalence of prediabetes among students at a Sudanese higher education institution, specifically Nile College. The findings provide important baseline data, with the prevalence of prediabetes among the participants being 35.6%. This aligns with a study conducted in the western suburbs of Paris, where prediabetes and undiagnosed diabetes were reported among subjects with cardiovascular risk factors based on the American Diabetes Association (ADA) criteria [16].

Prediabetes is a known risk factor for developing type 2 diabetes mellitus (T2DM) and is associated with increased risk of cardiovascular events and ischemic stroke. Studies suggest that elevated fasting plasma glucose and 2-hour postload glucose levels are predictors of stroke, with postload glucose levels being particularly significant [15]. Given the high

prevalence of prediabetes among Nile College students, early identification and intervention are crucial.

Effective management of prediabetes can delay or even prevent progression to diabetes [16,17]. Lifestyle modifications, including increased physical activity and improved dietary habits, are central to reducing the risk of diabetes [16,18]. Pharmacological options such as metformin, acarbose, GLP-1 receptor antagonists, and thiazolidinediones have also shown efficacy in decreasing diabetes incidence in individuals with prediabetes [16,19,20,21].

Our findings highlight the urgent need for proactive screening and prevention programs targeting prediabetes among university students in Sudan. Incorporating lifestyle education, promoting physical activity, and providing nutritional guidance could significantly reduce the burden of prediabetes and its associated risks in this population.

Limitations

Our study has an important value in prophylaxis of diabetes mellitus. We hope to help people at risk of diabetes mellitus to be protected from this disease by known ways of preventing obesity as example of one of diabetes risk factor.

Conclusion

This study reveals a high prevalence of prediabetes (34.7%) among Nile College students, driven by factors like family history, elevated BMI, sedentary lifestyles, and poor dietary habits. Early detection and prevention are essential to halt progression to type 2 diabetes and reduce associated risks. Lifestyle modifications, including improved diet and physical activity, along with targeted interventions, are critical to addressing this health concern in young populations.

References:

1. Khan MM, Chua JY, Tan JC, Yang Y, Liao Z, Zhao Y. (2019). From Pre-Diabetes to Diabetes: Diagnosis, Treatments and Translational Research. *Medicina (Kaunas)*, 55(9):546.
2. Beulens J, Rutters F, Rydén L, Schnell O, Mellbin L, Hart HE, Vos RC. (2019). Risk and management of pre-diabetes. *Eur J PrevCardiol*. 2019 ;26(2_suppl): 47-54.
3. Echouffo-Tcheugui JB, Selvin E. (2021). Prediabetes and What It Means: The Epidemiological Evidence. *Annu Rev Public Health*, 42: 59-77.
4. American Diabetes Association. (2019). Classification and diagnosis of diabetes: standards of medical care in diabetes-2019. *Diabetes Care*, 42: 13-28.
5. Tapp RJ, Zimmet PZ, Harper CA, de Courten MP, McCarty DJ, Balkau B, et al. (2006). Diagnostic thresholds for diabetes: the association of retinopathy and albuminuria with glycaemia. *Diabetes Res Clin Pract*, 73: 315-321.
6. Zand A, Ibrahim K, Patham B. (2018). Prediabetes: Why Should We Care? *Methodist Deakey Cardiovasc J*, 14 (4): 289-297.
7. Yoshida Y, Wang J, Zu Y, Fonseca VA, Mauvais-Jarvis F. (2023). Rising Prediabetes, Undiagnosed Diabetes, and Risk Factors in Young Women. *Am J Prev Med*, 64 (3):423-427.
8. Saleh M, Kim JY, March C, Gebara N, Arslanian S. (2022). Youth prediabetes and type 2 diabetes: Risk factors and prevalence of dysglycaemia. *PediatrObes*, 17(1):12841.
9. Paschou SA, Bletsas E, Saltiki K, Kazakou P, Kantreva K, Katsaounou P, Rovina N, Trakada G, Bakakos P, Vlachopoulos CV, Psaltopoulou T. (2022). Sleep Apnea and Cardiovascular Risk in Patients with Prediabetes and Type 2 Diabetes. *Nutrients*, 14(23):4989.
10. Latif R, Rafique N. (2020). Prevalence and Risk Factors of Prediabetes in Young Saudi Females in a University Setting. *Ethiop J Health Sci*. 30(6): 929-940.
11. Viswanathan V, Kumpatla S, Aravindalochanan V, Rajan R, Chinnasamy C, Srinivasan R, Selvam JM, Kapur A. (2012). Prevalence of diabetes and pre-diabetes and associated risk factors among tuberculosis patients in India. *PLoS One*. 7(7): 41367.
12. Basit A, Fawwad A, Qureshi H, et al. (2018). Prevalence of diabetes, pre diabetes and associated risk factors: second National Diabetes Survey of Pakistan (NDSP), 2016-2017. *BMJ Open* 8:020961.
13. Hauguel-Moreau M, Hergault H, Cazabat L, Pépin M, Beauchet A, Aïdan V, Ouadahi M, Josseran L, Hage M, Rodon C, Dubourg O, Massy Z, Mansencal N. (2023). Prevalence of prediabetes and undiagnosed diabetes in a large urban middle-aged population: the CARVAR 92 cohort. *Cardiovasc Diabetol*, 22(1):31.
14. Yesmin M, Ali M, Saha S. (2023). The prevalence and influencing factors of coexisting prediabetes and prehypertension among Bangladeshi adults. *BMC Public Health*, 23(1):1184.
15. Fonville S, Zandbergen AA, Koudstaal PJ, den Hertog HM. (2014). Prediabetes in patients with stroke or transient ischemic attack: prevalence, risk and clinical management. *Cerebrovasc Dis*, 37(6):393-400.
16. American Diabetes Association. (2018). Chapter 5. Prevention or Delay of Type 2 Diabetes: Standards of Medical Care in Diabetes - 2018. *Diabetes Care*, 41: 51-54.
17. Ryden L, Grant PJ, Anker SD, et al. (2013). ESC Guidelines on diabetes, pre-diabetes, and cardiovascular diseases developed in collaboration with the EASD: the Task Force on diabetes, pre-diabetes, and cardiovascular diseases of the European Society of Cardiology (ESC) and developed in collaboration with the European Association for the Study of Diabetes (EASD). *Eur Heart J*, 34 (39):3035-3087.
18. https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=Glucophage+SR-smpc.+%282019%29.+https%3A%2F%2Fwww.medicines.org.uk%2Femc%2Fproduct%2F6298%2Fsmpc.+Accessed+06+February.+2017.&btnG=
19. Kernan WN, Viscoli CM, Furie KL, et al. (2016). Pioglitazone after Ischemic Stroke or Transient Ischemic Attack. *N Engl J Med*, 374(14):1321-1331.
20. Armato JP, DeFronzo RA, Abdul-Ghani M, Ruby RJ. (2018). Successful treatment of prediabetes in clinical practice using physiological assessment (STOP DIABETES). *Lancet Diabetes Endocrinol*, 6(10):781-789.
21. Holman RR, Coleman RL, Chan JCN, et al. (2017). Effects of acarbose on cardiovascular and diabetes outcomes in patients with coronary heart disease and impaired glucose tolerance (ACE): a randomised, double-blind, placebo-controlled trial. *Lancet Diabetes Endocrinol*, 5(11):877-886.
22. Ranganathan P, Caduff C. (2023) Designing and validating a research questionnaire - Part 1. *Perspect Clin Res*, 14(3): 152-155.



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