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Prevalence and risk factors of diabetes mellitus among middle-aged school teachers in Mandalay City

**Khin Phyu Phyu, *Maung Maung, *Lei Lei Win,* Khaing Khaing Mar,*Zaw Win Tun, *Mya Marlar, **Win Khaing, ***Khin Than Aye & *Kyaw Zin Thant*

*Department of Medical Research (Upper Myanmar)
**Department of Preventive and Social Medicine
University of Medicine (Mandalay)
***Medical Unit II, Mandalay General Hospital

This cross-sectional, descriptive study was explored prevalence of diabetes mellitus (DM), latent DM and risk factors among 40-60 years old of school teachers in Mandalay City for further strengthening of prevention strategy. Collecting data by interview using structured questionnaires, anthropometry measurement and laboratory investigation of fasting blood glucose level from respective respondents were performed. A total of 522 subjects including 455 women (87.2%) and 67 men (12.8%), gave informed consent to participate in this study. Average age was 49.5±5.1 years. Prevalence of total cases was 15.9% (83/522). Among them, 4.2% (22/522) cases were identified as known cases. Prevalence of newly diagnosed case was 12.2% (61/500). To identify significant risk factors, bivariate and multivariate logistic regression analysis was done using R statistic software. Age, sex, marital status, history of delivery of big baby, family history of DM, smoking, drinking, exercise and BMI were included in modeling of logistic regressions. Age group over 45 (OR=2.69, p=0.01), family history in siblings (OR=2.39, p=0.018) and BMI: pre-obese (OR=2.08, p=0.015) and obese (OR=3.35, p=0.033) were identified as major risk factors for DM. Therefore, people with these factors should be treated as a target group for intervention, prevention or early detection of DM.

INTRODUCTION

Diabetes mellitus (DM) is a challenging health problem because of its chronicity and high demands for daily monitoring and care. The highest prevalence of DM in the Southeast Asia Region is between 45 and 65 years of age, the more economically productive age group [1]. Risk factors associated with type 2 diabetes are older age, obesity, family history of the disease, hypertension, dyslipidemia, physical inactivity, and belonging to certain ethnic groups. The greater the number of risk factors a person has, the greater the chance of developing the disease [2].

In 2001, a study on antidiabetes traditional medicine was conducted in Mandalay City among 522 school teachers of both sexes, aged 30-60 years. It showed that the proportions of DM among male school teachers were 3.2% and 4% at age 40-50 and 51-60 years, respectively. The rates of DM among female school teachers were 2.3%, 3.2% and 7% at the age groups of 30-40, 41-50, 51-60 years, respectively. Present study aimed to identify the prevalence rate and the associated risk factors of DM among middle- aged school teachers in Mandalay City. The outcome of the study would be utilized as baseline data for prevention and control of DM.

MATERIALS AND METHODS

Study population

The study was conducted in five townships of Mandalay City in the middle-aged (40-60 years) school teachers. Sample size was

calculated by using Epi-info 6 software for descriptive study using simple random sampling with the population size of 1834 teachers. The prevalence of diabetes was assumed to be about 7%. It is estimated that for the prevalence of DM with a precision level of ±2.4%, the required sample size is 446 in number.

The sampling frame was constructed by making a list of teachers ranging from 40 to 60 years of age from the register of high school teachers in Mandalay City under the Department of Basic Education No. 2. Subjects were chosen by simple random sampling from the sampling frame. Randomizing was done by using random number generated from Microsoft Excel version 2003. If a chosen subject did not give consent or had to be excluded by the criteria, the subject was replaced by the second nearest person of the same sex working in the same school.

Data collection was done from 17 November 2008 to 30 January 2009. It was a community and laboratory-based, cross-sectional, descriptive study. The questionnaire consisting of 13 questions were explored. Those with a known history of DM and hypertension were included. Two millilitres of blood were withdrawn from each subject after obtaining their informed consent, and glucose analysis was done. A total of 522 blood samples were analyzed for the study.

The study was accepted by the Ethical Committee on Medical Research (Upper Myanmar) on 12th September, 2008.

Measurement

Height (centimeters) and weight (kilograms) were measured and BMI was calculated. Blood samples were collected in sodium fluoride tubes after at least 8 hours of fasting and glucose analysis was done on the same day at the Biochemistry Research Division, Department of Medical Research (Upper Myanmar). Plasma glucose levels were determined by the glucose-oxidase method as recommended by WHO using Spectrophotometer UV-1601 PC Shimadzu, Japan [3].

Data entry and analysis

Data entry was done using Microsoft Excel version 2003. The Microsoft Excel database was transferred into STATA format by using Stat-transfer version 8. After cleaning and checking the consistency of the data-base, the data were analyzed by using R Statistical software version 2.9.2 and Epicalc package 2.9.1.2. Risk factors were identified using logistic regression modeling.

RESULTS

A total of 522 teachers (455 women and 67 men) participated in the study. Average age ±SD was 49.5±5.1 years with a range of 40-60 years. The mean glucose level of participants (n=522) was 113.7±38.2 mg/dl with a range of 70-390 mg/dl. Among 522 participants, 83 were shown to be positive for DM. Therefore, the prevalence of DM was estimated to be 15.9% among school teachers in Mandalay City. Of the total subjects, 4.2% (22 cases) already known that they were diabetics while 11.7% (61 cases) did not know they had the disease. Proportion of newly identified diabetics was 2.8 times higher than that of previously diagnosed subjects.

Bivariate analysis of the association between blood glucose and age, sex, hypertension, family history of father, family history of mother, family history of siblings, father's relatives, mother's relatives, smoking, alcohol, exercise and BMI are shown in Table 1.

In this study, significantly higher prevalence of DM was found in the subjects with the age of 45 years and above. Number of female school teachers was more than that of male school teachers in the study population. Among 455 female school teachers, 69 (15.2%) were diabetics, compared with 14 out of 67 male school teachers (20.9%).

Significantly higher prevalence of DM was also found among married persons, those

Table 1. Prevalence of diabetes among subjects

Variables	Total n=522	No. of diabetes (%)	OR (95%CI)	p
Age (years)				**0.004**
<=45	127	10 (7.9)	1	
>45	395	73 (18.5)	2.65 (1.30-5.95)	
Sex				0.231
Male	67	14 (20.9)	1	
Female	455	69 (15.2)	0.68 (0.35-1.40)	
Marital status				**0.024**
Single	209	24 (11.5)	1	
Ever married	313	59 (18.8)	1.79 (1.05-3.12)	
History of delivering big baby				
No	212	33 (15.6)	1	0.112
Yes	50	13 (26.0)	1.9 (0.84 - 4.15)	
Other (male, un-married women)	260	37 (14.2)	0.9 (0.52 - 1.55)	
Hypertension				**0.031**
No	372	51 (13.7)	1	
Yes	150	32 (21.3)	1.7 (1.01-2.85)	
Family history in father				**0.009**
No	469	68(14.5)	1	
Yes	53	15(28.3)	2.32 (1.12-4.61)	
Family history in mother				0.231
No	466	71(15.2)	1	
Yes	56	12(21.4)	1.52 (0.69-3.1)	
Family history in siblings				**<0.001**
No	451	59(13.1)	1	
Yes	71	24(33.8)	3.38 (1.84-6.13)	
Family history in paternal side				**0.018**
No	478	70(14.6)	1	
Yes	44	13(29.5)	2.44 (1.11-5.08)	
Family history in maternal side				0.058
No	475	71(14.9)	1	
Yes	47	12(25.5)	1.95 (0.88-4.07)	
Smoking				0.989
No	497	79(15.9)	1	
Yes	25	4 (16)	1.01 (0.24-3.1)	
Alcohol				0.773
No	488	77 (15.8)	1	
Yes	34	6 (17.6)	1.14 (0.37-2.94)	
Exercise				0.405
No	372	56(15.1)	1	
Yes	150	27(18.0)	1.24 (0.72-2.1)	
BMI				0.013
Normal	335	42(12.5)	1	
Pre-obese	162	34 (21.0)	1.85 (1.09-3.13)	
Obese	25	7 (28)	2.7 (0.9-7.3)	

who have the history of hypertension, those with the diabetic father, sibling or paternal relative and those who were obese.

No association was found between smoking, alcohol or exercise and diabetes mellitus in our study. As 22 subjects were already known to be DM, only 500 subjects were analyzed for the determination of risk factors in multivariate analysis.

The abovementioned variables, together with results of logistic regression model in association between diabetes and selected factors are shown in Table 2.

Table 2. The association between diabetes and selected factors as calculated by logistic regression method

Factors	Adj. OR (95%CI)	p (Wald's test)	p (LR test)
Age			
Above 45 vs. 40-45	2.69 (1.17, 6.15)	0.019	0.010
Gender marital: ref.= Male single			0.034
Female single	1.16 (0.14, 9.6)	0.888	
Male ever-married	4.39 (0.51, 37.96)	0.179	
Female ever-married without history of big baby	1.36 (0.17, 11.11)	0.774	
Female ever-married with history of big baby	2.56 (0.29, 22.86)	0.399	
Family history in siblings ref.=Yes vs. No	2.39 (1.16, 4.91)	0.018	0.024
BMI ref =Normal			0.017
Pre-obese	2.08 (1.15, 3.77)	0.015	
Obese	3.35 (1.1, 10.18)	0.033	

History of hypertension, history of having DM in mother and her relatives, some risk factors such as smoking, alcohol drinking and doing exercise have been related to DM in many other studies; however, these variables were not identified as risk factors in our population.

The significant relationship between getting DM and family history in mother, smoking, alcohol and exercise in univariate analysis were lost, when adjusted for the other variables in the multivariate model. Age, family history and BMI were found as significant predictors.

Although composite interaction-term variable of gender, marital status and history of delivering big baby was significant at LR test, all these three factors were not likely to increase ORs for DM individually since Wald's test p values were larger than 0.05.

DISCUSSION

In our study, prevalence of diabetes was explored among school teachers population in Mandalay City. The prevalence of diabetes was 15.9% in this particular study. The prevalence of known diabetes was 4.2% and that of previously undiagnosed diabetes was 11.7%, so that the proportion of undiagnosed diabetes was 2.8 times greater than that of previously known cases. This is probably due to teachers' lack of knowledge, possibly thinking the symptoms (i.e., thirst, diuresis, less sensation in lower limbs) were due to their work load and not realizing that these were symptoms of the disease. Similar findings on adult Moroccan Sahraoui women were reported [4]. In univariate analysis, the higher prevalence in subjects above the age of 45 found in our study is similar to the findings of a study from Turkey [5], indicating the higher prevalence among males.

Although we found a relationship between reported history of hypertension and DM in univariate analysis which was similar to the study in Turky, the evaluation of blood pressure cannot be considered solely as a risk factor. The gradual downgrading in renal function in diabetic patients may lead to secondary hypertension according to natural history of disease. Hypertension was, therefore, not included as a potential risk factor for diabetes in the multivariate analysis. DM is known to have a hereditary component.

We did not find any association between smoking, alcohol or exercise and DM among school teachers despite these variables having being reported in other studies to be related with DM. The low proportion of teachers who smoke or drink alcohol may have limited the power to detect any association.

It was found that DM is associated with age (above 45), BMI (>25), and family history in siblings. Although gender and reproductive life were associated with DM in logistic regression model, we could not find any statistical significance between DM and individual factors (such as gender, marital status and history of delivering a big baby). The high proportion of obese among our school teachers is of concern. This may be related to the sedentary nature of life style. Reducing BMI may be an important component of any strategy in reducing the risk of DM among this population.

Conclusion

The risk factors of DM among teachers are multi-factorial. Among them, BMI is potentially modifiable risk factor and appropriate body weight should, therefore, be maintained to help reduce the risk of DM. The rest, non-modifiable risk factors such as age (above 45), family history in siblings, are also significantly associated with DM in our study. Therefore, people with these factors should be treated as a target group for intervention for prevention or early detection of DM.

REFERENCES

1. World Health Organization, Regional Office for South -East Asia. Evidence and Health Information, Health Situation, South-East Asia Progress Towards Health For All (1977-2000).
2. American Diabetes Association and National Institute of Diabetes. Digestive and Kidney Diseases: The prevention or delay of type 2 diabetes. *Diabetes Care* 2002; 25(4):742-749.
3. World Health Organization. Blood safety and clinical technology guidelines on standard operating procedures for Clinical Chemistry, Glucose Oxidase Method, 2005. Available from URL: http://www. whosea. org/ EN/Section 10/ Section17/ Section 53/Section 481-1753.htm.
4. Rguibi M & Belahsen R. Prevalence and associated risk factors of undiagnosed diabetes among adult Moroccan Sahraoui women. *Public Health Nutrition* 2005; 9 (6):722-727.
5. Aksu H, Pala K, *et al*. Prevalence and associated risk factors of type 2 diabetes mellitus in Nilufer District, Bursa, Turkey. *International Journal of Diabetes and Metabolism* 2006; 14: 98-102.