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Original Article

THE ASSOCIATION OF TYPE 2 DIABETES WITH OBESITY AND OTHER FACTORS: IN MULTINATIONAL COMMUNITY

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ABSTRACT

Objective: Quantifying the influence of Obesity and other contributing factors on inducing Type 2 Diabetes is important to allow for rational planning and allocation of resources. Therefore, the major aim of this study was to estimate theinfluence of obesity on inducing Type 2 Diabetes and explore the relationship between Type 2 Diabetes and different contributing factors such as age, gender, race, type of food taken and family history in a many healthy and non-healthy human multinational volunteers in the United Arab Emirates.

Methods: A stratified cross-sectional analysis observational study was conducted on 800 healthy males and non-pregnant female volunteers aged between 18 and 45 years old. A Structured Investigational Assessment (SIA) as a principle of analysis was used to find out the contributing factors and correlations between obesity and Type 2 Diabetes. SIA was well designed and highly structured to allow the same types of information to be collected from a large number of people in the same way and for data to be analyzed quantitatively and systematically. Information obtained from volunteers contained age, race, gender, weight, height, quality of food taken, smoking status, medical conditions, emotional, material and physical activity status. Pearson's chi square test was used to study the significance of different contributing factors and obesity on inducing Type 2 Diabetes.

Results: Results indicated a significant difference that was found between the presences of Type 2 Diabetes in obese volunteers compared to non-obese volunteers regardless, age, race, and gender. However, analysis showed that gender, age, race, family history with Type 2 Diabetes and quality of food taken as one of the contributed factors that can induce Type 2 Diabetes, even in the non-obese adults.

Conclusion: Our findings revealed that female, Middle Eastern and obese people who consume non-healthy food are at higher risk for developing Type 2 Diabetes. This can be attributed to the lack of awareness and public health education. Therefore,the prevalence of Type 2 Diabetes is high among the United Arab Emirates population and represents a major clinical and public health problem. A national prevention program to prevent diabetes and address the modifiable risk factors at the community level, targeting high-risk groups, should be implemented.

Keywords: Obesity, Type 2 Diabetes, Food quality, Community.

INTRODUCTION

Diabetes is a metabolic disorder with two major types, 1 & 2. This study, focused on Type 2 diabetes (T2D), which is formerly known as non-insulin-dependent diabetes, or adult-onset diabetes, with onset most common in middle age and later life [1]. Generally, it is due to a combination of relatively impaired insulin secretary function of pancreatic B-cells and insulin resistance [2]. However, Type 2 Diabetes occurs when insulin resistance increases and insulin production by pancreatic b-cells fails to increase [2]. Unlike Type 1 Diabetes, Type 2 Diabetes does not often necessitate the use of insulin, because insulin production is still possible, although impaired. The rates of the predominance for Type 1 Diabetes and Type 2 Diabetes are on the rise worldwide, and this has generated a strong drive towards developing prevention and cure [3]. The influence of obesity on inducing Type 2 Diabetes has been well described [4, 5, 6].

Thus, a direct relation would be expected between Type 2 Diabetes and Obesity. However, few published studies have investigated this correlation in the United Arab Emirates. A study in USA, described a significant influence of obesity on inducing Type 2 Diabetes [6]. Another study in Asia also showed how excess weight plays a big role in inducing Type 2 Diabetes [7]. Indeed, many studies described the risk factors of Type 2 Diabetes as obesity, physical inactivity, and low birth weight [8, 9]. Several factors contributed in the development of Type 2 Diabetes, such as type of food taken, gender, age and race [10]. Furthermore, the rising incident of Type 2 Diabetes and its associated complications in the Arabic countries has been increased dramatically over the last three decades [11]. This could be due to the increased industrial development, wealth generated by oil-rich resources in the Arabian Gulf, while there have also been a significant change in the type of food taken, reduced physical activity and a greater reliance on migrant workers. Six Arabic Gulf countries considered to be world's leaders in term of Type 2 Diabetes prevalence are: Kuwait, Qatar, Saudi Arabia, Bahrain, and United Arab Emirates (UAE) [11]. Various studies in the United Arab Emirates, studiedType1 Diabetes rather than Type 2 Diabetes, noteworthy to mention, that rare studies in UAE explores Type 2 Diabetes contributing factors. The aim of this research was to study the association between Type 2 Diabetes and Obesityin a sample of multinational communityand explores the relationship between Type 2 Diabetes and different contributing factors.□

MATERIALS AND METHODS

The University Research Ethics Committee (PH175) has approved the research proposal. A stratified sample of the United Arab Emirates was surveyed from 15/12/2013 till 18/1/2014. The samples was selected through Community Healthcare Centers across the country such as Nutrition Centers, Hospitals, Clinics, Entertainments place, and Pharmacies, and were stratified according to the gender, age, healthy and unhealthy body, type of food taken, family history with Diabetes, smoking and non-smoking. Both genders (male and female) aged between 18 and 45 years old were included, however all were with different body weight. Pregnant women were excluded from this study. 800 surveys were distributed to Community health care centers, 630 people participated and filled the survey, and 28 surveys were excluded from analysis due to incomplete answers. A total of 602 surveys were included in the analysis. Table (1) summarizes the demographic data of the study sample. The self-administered survey consisted of ten-question patient health questionnaire, which was designed according to the guideline of the diagnostic and statistical manual of Type 2 Diabetes disease. The ten questions were related to different Diabetes factors, where the sample can determine the

influence of obesity and other contributing factors on inducing Type 2 Diabetes. The influence of obesity on inducing Type 2 Diabetes was diagnosed through calculating BMI of samples and knowing other contributing factors such as gender, type of food taken, age and race as shown in the results. The severity of obesity was assessed according to the calculated BMI as follows: Normal (BMI 18.5-25), Overweight (BMI 25-30) and Obese (BMI > 30) and was measured according to the three classes of Obesity, Obese Class I (Moderately Obese) BMI from 30-35, Obese Class II (Severely Obese) BMI from 35-40 and Obese Class III (Very Severely Obese) BMI over 40. Chi square test was used to evaluate the significance of different demographic data on the presence of Type 2 Diabetes. *P-value* of 0.05 or less was considered statistically significant.

RESULTS

Based on the analysis of the survey results, the influence of obesity and other contributing factors on inducing Type 2 Diabetes was estimated to be very significant. Female reported a higher percentage of Type 2 Diabetes than male (67% and 33% respectively), though it was extremely significant (P< 0.01) (Fig. 1).Most of the self-reported Diabetic cases were within the age of 40-45+ (75%); few were within the age of (29-39) (23%) and only (1%) were within the age of (18-28) (Fig. 1)(Average score Age ± SEM: 42.4 ± 0.45). Race has a significant influence, Middle Eastern tended to report the highest percentage among the other countries (42% respectively) (Fig. 2). Family History had shown a very significant difference on being Diabetic among the study sample (P=0.001). Type of food Taken was found to exert a significant effect (53%)of the self-reported Diabetic cases claimed consuming Unhealthy food (Fig. 1). The most significant factor contributed in the induction of Type 2 Diabetes was found to be Obesity (P < 0.01), (59%) with (BMI > 30) claimed being Diabetic (Fig. 1)(Average score BMI ± SEM: 38.7 ± 0.43). Furthermore, most of the self-reported diabetic cases were severely obese (39%) and only (28.7%) were considered very severely obese (Fig. 3). No statistically significant differences were found with the following variables: suffer from certain diseases, use of any medication and cigarette smoking status (P>0.05).

DISCUSSION

The Influence of obesity and other contributing factors on inducing Type 2 Diabetes has been well reported in many studies around the world. A number of research studies showed how gender could play a significant role on inducing Type 2 Diabetes. Mei Tang, et al. "conducted a systemic review of 39 021 subjects (17 730 males and 21 291 females) on the development of Type 2 Diabetes based on sex-difference, and found the development of Type 2 Diabetes was 6.6% among male and 5.5% among female" [12]. However, our finding reveals the higher percentage of female being Diabetic than male (67% and 33% respectively). Similar results were found in three studies conducted among community in UK, Netherland and Italy [13], [14], [15]. A systemic review was conducted to document the development of the metabolic syndrome among male and female in Member States of the Gulf Cooperative Council (GCC; Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates)-countries in which obesity, Type 2 diabetes and related metabolic and cardiovascular diseases were highly prevalent.

Table 1: Demographic Data of the surveyed sample

Total Number of subjects 602			
Age		Type of food taken	
18-28	212(35.2%)	Healthy food	245(41.0%)
29-39	136(45.0%)	Unhealthy food	257(43.0%)
40-45+	254(42.0%)	Vegetarian	100(16.0%)
Race		Smoker	
Africans	67(11.2%)	Yes	250(41.5%)
Europeans	66(11.0%)	No	352(58.5%)
Middle eastern	102(17.0%)	Use of any medication	236(39.0%)
Asians	61(10.0%)	Yes	366(61.0%)
Nationals	71(12.0%)	No	188(31%)
Indian	69(11.5%)	Suffer from certain disease	414(69%)
Americans	66(11.0%)	Yes	
Australians	65(10.8%)	No	
New Zealand	33(5.50%)		
Gender		Family History with	
Male	307(51.0%)	Type 2 Diabetes	
Female	295(49.0%)	Yes	320(53%)
		No	282(47%)
BMI		Suffer from Type 2	
Normal	161(27.0%)	Diabetes	
Overweight	200(33.0%)	Yes	226(%)
Obese	241(40.0%)	No	376(%)

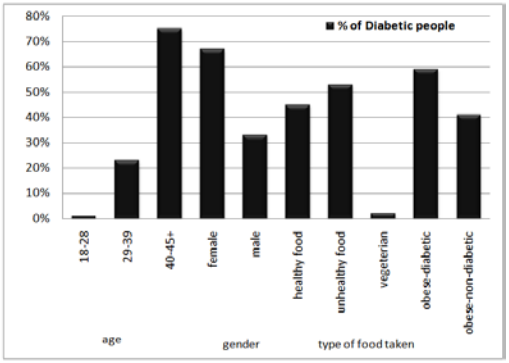

Fig. 1: variables with significant influence on inducing type 2 diabetes (N=226).

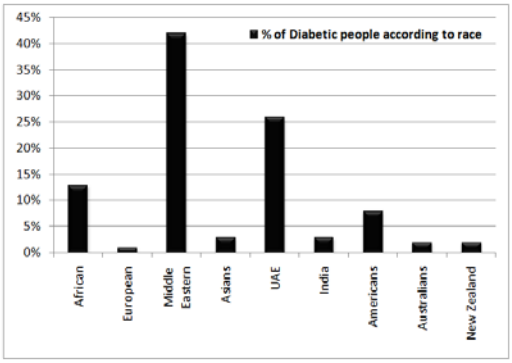

Fig. 2: Different races with significant influence on inducing type 2 diabetes(N=226).

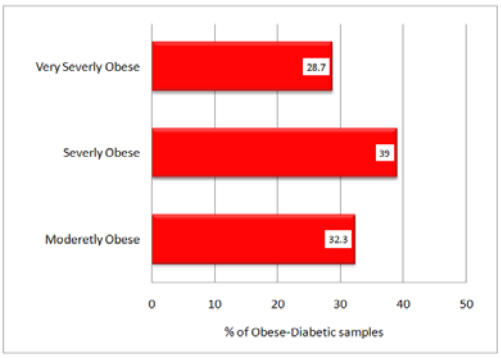

Fig. 3: Show severity of obesity (N=133).

The study showed that, "for male, the development of the metabolic syndrome ranged from 29.6% to 36.2%; and, for female, from 36.1% to 45.9%" [16]. According to our findings female are more susceptible to Type 2 Diabetes than male. This could be attributed to poorer quality of sporty and active life style, prolonged sitting timing and dietary intake [16, 17]. Besides, previous studies showed that depression is twice common in female than male, and may take a greater toll on female with Type 2 Diabetes than male [18]. A significant relationship was found between age and Type 2 Diabetes, more particularly for those people who claimed living unhealthy lifestyle. As shown in our results, 75% of the self-reported Diabetic cases were within the age of 40-45 years. This is an interesting finding showing that age is one of the significant contributing factors of Type 2 Diabetes. Bigger ML, et al. conducted a prospective study on the risk factors that induce Type 2 Diabetes. His findings revealed that half of the patients with Type 2 Diabetes were diagnosed over the age of 50 [19]. Similar results were found in a study conducted among community in USA [20]. In general, there is a significant relationship between aging and increase in body weight and fat mass, which is correlated with insulin resistance. Changes in body composition with aging by diet and exercise training could delay the onset of insulin resistance [21]. Furthermore, Obesity was found to be the most significant risk factor contributed with Type 2 Diabetes. Our finding revealed that 59% of the self-reported Diabetic cases were Obese (BMI >30). We have calculated the BMI and characterized the obese diabetic cases to explore how obesity significantly influences the induction of Type 2 Diabetes. All cases within the BMI range of 30kg/m2 - 40kg/m2 and above were considered obese following Japan Society for the Study of Obesity (2000) [22]. Gautier A, et al. conducted a comparison study between "2,947 participants with a BMI of <27 kg/ m2 and the 879 with a BMI of >or=27 kg/ m2, and found that 92 incident cases of diabetes in individuals with a BMI of <27 kg/ m2 and 111 in those with a BMI of >or=27 kg/ m2" [23]. According to Butheinah A. Al-Sharafi, et al. study, the development of obesity in patients with Type 2 Diabetes mellitus (BMI 25-29.9 kg/ m2), and obese (BMI ≥ 30 kg/ m2) in Yemen was considered high with respect to the Yemeni population, especially in females [35]. In general, women with a BMI between 23 and 25 kg/ m2 have an almost three-fold increased risk of developing Type 2 Diabetes compared with women with a BMI below 23 kg/ m2 this relative risk increases to 20 for women with BMIs ≥ 35 [24]. A significant difference was found between Type 2 Diabetes and race. In our findings, cases that claimed to be a Middle Eastern revealed the highest percentage of Type 2 Diabetes compared to the other countries, with particular to Arabs that showed one of the highest (26%). According to Hussein, et al. Study, United Arab Emirates reveal (10.5%, 6.6% and 20.2%, respectively) towards the development of diagnosed Type 2 Diabetes, undiagnosed Type 2 Diabetes and pre-diabetes [25]. Therefore, the development of Type 2 Diabetes in neighbor countries was statistically evaluated to be high. In Saudi Arabia (KSA) population, the development of Type 2 Diabetes estimated to be (30%) and represents a major clinical and public health problem [26]. Moreover, another study on Bahraini population showed the development of Type 2 Diabetes estimated to be (35%) [27]. In general, Middle East countries, particularly Arabian Gulf are more susceptible to Type 2 Diabetes than other countries which could be attributed to several reasons mentioned above. Another important finding in this research was the high percentage of cases that claimed consuming unhealthy food (junk and fast food) were suffering from Type 2 diabetes (53%). It is noteworthy to mention that lifestyle also influences the development of Type 2 Diabetes [33]. A study carried in Singapore, revealed that eating fast food two or more times a week increase the risk of developing Type 2 Diabetes by (27%)[28].

This was supported by previous studies that showed a large meal rich in red meat, unhealthy fats, and sugary drinks could significantly contribute in inducing Type 2 Diabetes [29]. However, consumption of Whole-grain is greatly associated with reducing risk of Type 2 Diabetes [30]. Similar results were found in two studies conducted in the USA and New Zealand [31-32]. Furthermore, Type 2 Diabetes has a strong link to family history; although it strongly depends on environmental factors. Studies of twins have shown that genetics play a very strong role in the development of Type 2 Diabetes [33-34].

CONCLUSION

This study has provided epidemiological information on the extent of Type 2 Diabetes as a health problem and has emphasized the value of having accurate population-based information on the epidemiology of Type 2 Diabetes and knowing its significant factors in our population for future planning and implementation. By providing information on the trend of diabetes in our community, this study provides important clues as to the magnitude and structure of the primary and secondary intervention programs that will be required to effectively manage this disease. However, our findings suggest that weight loss, regular exercise, modification of diet, and quitting smoking could prevent the majority of cases of Type 2 Diabetes. Weight control would appear to offer the greatest benefit.

CONFLICT OF INTERESTS

Declared None

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