

Changes In Type2Diabetes Risk Factors Among Employees Of Aluminum Company Of Egypt In The Last Three Years

Ali .M.Kassem, Eman.A.Sabet, Sharaf.E.Shazly,Nashwa.M.Yahia

Internal medicine department, Sohag faculty of medicine, Sohag university.

ABSTRACT

Background: The risk of developing type 2 diabetes increases with age, obesity, and physical inactivity. Type 2 Diabetes shows strong familial aggregation, so that persons with a parent or sibling with the disease are at increased risk, as are individuals with obesity, hypertension, or dyslipidemia and women with a history of gestational diabetes. (1)

Objective: changes in type 2 diabetes risk factors among employees of aluminum company of Egypt in the last three years.

Patient & Method : The subjects were requisitioned by using(FINDRISC) score system that include; age, diet, physical activity, vegetable& fruit intake, medical history of anti diabetic medication or antihypertensive medication, history of previous elevation blood sugar , and family history of diabetes. The subjects were examined for body mass index and waist circumference.

Results: The changes in the total risk results was highly significant (**p-value <0.001**) that there were **49** from **787** employees had increased their risk for developing diabetes . the possible estimated factors that responsible for increased risk of type 2 diabetes were **7** from the previous **8** factors the only exception was waist circumference .

Conclusion:The most independent factors in increasing risk among the employees were the changes in physical activity, followed by the use of antihypertensive therapy , the past history of elevation of blood sugar , then positive family history of DM and lastly BMI .

Keywords: type 2 diabetes risk factors .

Introduction

Diabetes is associated with increased morbidity& mortality and account for substantial proportion of overuse of health care resources worldwide (2).The worldwide prevalence of DM has risen dramatically over the past two decades from estimated 108 million cases in 1980 to 387 million in 2015.

Mortality attributable to diabetes ranges from 8.6 % of all deaths in adults aged between 20 and 79 years in the Africa region to almost 15.8 % the western pacific region (3). In Middle East and North Africa, 34.6 million people or 9.2% of the adult population have diabetes according to last

estimates. three of the world's top 10 countries with the highest prevalence of diabetes are in the middle east and north Africa region: Saudi Arabia, Kuwait and Qatar .In Egypt there are 7.5million people affected with diabetes coming to the 8th place worldwide according to last IDF Atlas estimation in 2015 and this number is expected to reach to 13.1 million by 2035, with prevalence around 15.6% of all adults aged 20-75 years old. (4)

The prevalence of diabetes in Egypt is high and the gradient in risk factors and disease from rural to urban areas and in urban areas from lower to higher socio-economic state suggests that diabetes is a major, emerging

clinical and public health problem in Egypt.(5) A person with type 2 diabetes can live for several years without showing any symptoms. However, during that time high blood glucose is silently damaging the body and diabetes complications may be developing. Studies have found that many people with undiagnosed diabetes already have complications such as chronic kidney disease and heart failure, retinopathy and neuropathy .(6) Previous studies have found appropriate lifestyle intervention and/or drug treatments are effective in delaying or preventing both diabetes and its complications. Accordingly, simple, sensitive and acceptable tools for identification of subjects at risk are warranted. (7)

Patient & methods: Three years ago , assessment of type 2 diabetes risk was performed among employees of Aluminum Company of Egypt in a study at Sohag University with title of "**RISK ASSESSMENT FOR DEVELOPING DIABETES IN**

Results

The study conducted on 787 employees which included 778 males and 9 females. we reassessed them after three years to detect the changes in the nine parameters of the (FINDRISK) score system. After that the total risk score changes is estimated which is depended on the changes of the eight individual risk factors changes . All the changes is calculated by both **pairedt-test** and **McNemar test**. Finally we explained in the result which is the most independent and responsible risk factors that increased the risk for developing type 2 diabetes among our participants. **As regard changes in age;** the majority of our participants (>60%) were under 45 years at time of inclusion in the study in 2015, with only 155 cases (19.7%) were between 45-54 years and 152 (19.3%) were over 55 years. In 2018, only 4 cases from the group (<45 years) became in the next age group (45-54 years) and another 4 cases from the age group (45-55) became in the age group (55-64 years). **As regard changes in BMI;** shows that the majority of our participants were either overweight (40%) or obese (30%). This did not change much between 2015 and 2018. **As regard changes in waist circumference;** shows that average waist circumference was seen in around half of the cases, with the other half having either increased waist circumference (25.8% in 2015 and 26.3% in 2018) or frank truncal obesity. Truncal obesity was seen in 23.6% of cases in 2015 and 23.9% in 2018. The change was minimal (only 6 cases changed their position over years). **As regard changes in physical activity;** over 80% of the cases did regular exercises. However, the percentage of those who had regular exercises decreased from 84% in 2015 to 82.6% in 2018. **As regard changes in**

UPPER EGYPT INDUSTRIAL COMMUNITIES". Those previously assessed employees are the subject of our study(8). Our study was carried out in Aluminum company of Egypt in the period of January (2017) to June (2018) and the target is the previously assessed employees (their number was1010 ; 1001 males& 9 females) .After application of our inclusion & exclusion criteria the employees included in our study were reassessed by (FINDRISK) scoring system to detect the changes in risk score for developing diabetes during the last three years.

Inclusion Criteria:

All employees who were previously assessed and included in the previous study three years ago without any of the excluded criteria mentioned later.

Exclusion Criteria:

The employees who were not included in the previous study & who were retired, died or refused the reassessment.

consumption of fruit & vegetable ; only less than one quarter of our participants ingested vegetables regularly in their diet. This ratio was 22.9% in 2015 and increased a little in 2018 to 23.4%. **As regard changes in the use of antihypertensive drugs;** the percentage of participants receiving antihypertensive therapy increased from only 10.9% in 2015 to 13% in 2018. **As regard changes in previous history of elevated blood sugar;** previous history of increased blood sugar was recorded in 3.5% of the study population in 2015. This percentage was raised to 5.2% in the year 2018, meaning that new 13 cases (1.6%) experienced elevated blood sugar between 2015 and 2018. **As regard changes in family history of DM;** the family history of diabetes mellitus was found in 36.6% of the participants in 2015 (28.1% recorded DM among their close relatives and 8.5% among far relatives). These figures increased in 2018 to 37.9% (28.3% among close relatives and 9.5% among far relatives).

The Comparison of the individual item scores between 2015 and 2018; shows that the mean value for risk for each individual risk factor increased significantly between 2015 and 2018, with the exception of BMI and vegetable intake.

	Mean score in 2015	Mean score in 2018	Paired t test	P value
Age	0.97±1.26	0.98±1.26	2.694	0.007 (S)
BMI	1.31±1.19	1.32±1.19	0.808	0.419 (NS)
Waist circumference	1.72±1.77	1.74±1.77	2.331	0.020 (S)
Exercises	0.32±0.73	0.34±0.76	2.408	0.016 (S)
Vegetables	0.76±0.43	0.76±0.43	0.654	0.513 (NS)
Antihypertensive treatment	0.22±0.62	0.26±0.67	3.803	<0.001 (HS)
Past history of elevated blood sugar	0.18±0.93	0.28±1.15	3.435	0.001 (S)
Family history of diabetes	1.66±2.25	1.70±2.25	2.399	0.017 (S)

Changes in total risk score between 2015 & 2018:

		2015	2018	Paired t test	P value
Total risk score	Mean	7.16	7.37	4.708	<0.001 (HS)
	SD	4.445	4.883		
	Median	7	7		
	Range	0-23	0-25		

Changes in risk of T2D between 2015 & 2018:

	2015	2018	McNemar test	P value
Very low risk	349(44.3%)	349(44.3%)	18.960	<0.001 (HS)
Low risk	286(36.3%)	265(33.7%)		
Intermediate risk	110(14%)	126(16%)		
High risk	38(4.8%)	35(4.4%)		
Very high risk	4(0.5%)	6(0.8%)		
Diabetic	0	6(0.8%)		

Changes in total risk: as shown below the change in risk percentage of increase is a great (6.2%) in spite of the short period (from 2015 to 2018) with the minimal or slightly detected change risk percentage of decrease (1.8%) .

	No	Percent
No change in risk	724	92.0%
Increased risk	49	6.2%
Decreased risk	14	1.8%
Total	787	100.0%

Univariate logistic regression analysis to estimate the possible factors responsible for increased risk for DM

Item	P value	Odd's ratio	CI of Odd's ratio
Age	<0.001(HS)	22.408	4.419-113.636
BMI	<0.001(HS)	23.875	5.893-96.724
Waist circumference	0.996 (NS)	5.509	0.004-299.529
Exercise	<0.001(HS)	12.098	5.659-25.863
Vegetables	<0.001(HS)	60.814	12.296-300.783
Antihypertensive treatment	<0.001(HS)	9.894	5.185-18.878
Past history of elevated blood sugar	<0.001(HS)	1.924	1.586-2.334
Family history of DM	<0.001(HS)	4.418	2.352-7.315

This table shows that 7 of the 8 factors may be responsible for increased risk for DM among those who had increased risk for DM between 2015 to 2018. The only exception was waist circumference. These 7 factors would be included in the following multivariate regression model to predict the possible independent risk factor for increased DM risk among our study population.

Multivariate logistic regression analysis to estimate the independent factors responsible for increased risk for DM

Item	P value	Odd's ratio	CI of Odd's ratio	Rank
Age	0.455(NS)	5.875	0.056-612.242	-
BMI	0.003(S)	19.979	2.795-142.806	5
Exercise	<0.001(HS)	22.064	7.427-65.546	1
Vegetables	0.106(NS)	6.074	0.683-54.031	-
Antihypertensive treatment	<0.001(HS)	17.014	5.503-52.603	2
Past history of elevated blood sugar	<0.001(HS)	1.943	1.451-2.602	3
Family history of DM	0.001(S)	4.096	1.798-9.333	4

This table shows that both age and vegetable intake cannot be considered as independent factors responsible for the increased risk for DM among our study population. The other 5 factors are independent risk factors for increased DM risk. Ranking of these 5 factors (depending on p value and Odd's ratio), revealed that the most important factor in increasing the risk score for DM was change in exercise behavior, followed by hypertensive therapy, then past history of elevated blood sugar, then family history of diabetes and lastly BMI.

Discussion

The changes in the age group (which is divided into three age groups <45 ,45-54 ,55-64) was minimal as only 4 cases from <45years became in the next age group (45-55) and another 4 cases from the age group (45-55) became in the age group (56-64).

The **body mass index changes** was also there was minimal significant changes in spite of the majority of the participants were either overweight (40%) or obese (30%) and both are associated with increasing risk of type 2 diabetes .

About the **waist circumference changes** also it is minimal significant however ; half of the employees were having either increased waist circumference (25.8% in 2015 and 26.3% in 2018) or frank truncal obesity (was seen in 23.6% of cases in 2015 and 23.9% in 2018) ,with average waist circumference (<94 cm in males and <80 cm in females)in the other half. The **physical activity changes**, about 80% of employees did regular exercise . However , the percentage of those who had regular exercises decreased from 84% in 2015 to 82% in 2018.

The **FINDRISK** model also includes **fruits and vegetables consumption**,this ratio was 22.9% in 2015 and increased a little in 2018 to 23.4% , that can be explained by the bad dietary habits of the Egyptian peoples and their socioeconomic level. These findings were similar to that of (9). In contrary to study of (10).

As regard history of **taking antihypertensive treatment** the percentage of participants receiving antihypertensive therapy increased greatly from 10.9% in 2015 to 13% in 2018 . This result was not similar to(11) .But similar to those of (12) .

However patient with history of **previous elevation of blood sugar**,

has greater risk of developing type 2 DM , the recorded number of the employees with positive history in 2015 reached to 3.5% and raised to 5.2% in 2018 . This means there is nearly doubling of the percentage of this risk factor.

The **family history of DM** the percentage were 36.6% in 2015 (28.1% recorded DM among their close relatives and 8.5% among far relatives) .These figures increased in 2018 to 37.9% (28.3% among close relatives and 9.5% among far relatives) .

After the comparison of the individual item scores between 2015 and 2018 we found the mean risk value for each item increased highly significantly in anti-hypertensive treatment (**p-value <0.001**)and significantly in age (**p-value 0.007**), past history of elevated blood sugar (**p-value 0.001**) , doing exercise (**p-value 0.016**) , family history of diabetes(**p-value 0.017**) and waist circumference (**p-value 0.020**) with the exception of BMI(**p-value 0.419**) and vegetable intake (**p-value 0.513**) .

The **changes in the total risk** results was highly significant (**p-value <0.001**) that there was 724 employees (92.0%) with no changes in risk ,49 employees (6.2%) with increased risk and 14 employees (1.8%) with decreased risk . the possible estimated factors **changes** that responsible for increased risk of type 2 diabetes among our participants were 7 from 8 factors the only exception was waist circumference .

The risk for diabetes between 2015 and 2018 changed highly significantly (**p-value <0.001**) that there were 6 detected diabetic cases still working in the company (they were assessed as very high and high risk group in the previous study three years ago) and another 7 diabetic cases retired (not included in the study), 6 cases with

very high risk (**4 cases in 2015**) , **126** cases with intermediate risk (**110 cases in 2015**) , **265** cases with low risk (**286 in 2015**) , **349** cases with very low risk (**the same in 2015**) , but there were **6** cases with high risk (**only 4 in 2015**). When we drew a line for changes in diabetes risk in each total risk group in we found that the line of risk for diabetes is nearly overlapped with the very high risk group risk changes line which empower the value and accuracy of (FINDRISK) in early detection of type 2 diabetes among high risk population.

Finally we found that the changes in both the age(**P-value 0.455 NS**) and vegetable intake(**P-value 0.106 NS**) cannot be considered as independent or responsible factors for increased risk for DM among our study population . The changes in the other 5 factors making them independent risk factors for increased DM risk . Ranking of these 5 factors ,revealed that the most important factors in increasing the risk score for DM was the changes in exercise behavior (**P-value <0.001HS**) ,followed by hypertensive therapy(**P-value <0.001HS**) ,then past history of elevated blood sugar (**P-value<0.001HS**) ,then family history of diabetes(**P-value 0.001**) and lastly BMI(**P-value 0.003S**).

Conclusion

The distribution of changes risk observed in our study suggests a substantial increase in type 2 DM prevalence over the next years if we do not take effective preventive measures.

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