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**RESEARCH ARTICLE**

**ASSOCIATION BETWEEN DIABETES MELLITUS AND HYPERTENSION: A CROSS SECTIONAL SURVEY IN
 JEDDAH, SAUDI ARABIA.**

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Manuscript Info**Abstract****Manuscript History**

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Key words:-

Introduction:- Diabetes mellitus (DM) and hypertension (HTN) are considered to be one of the most common chronic diseases globally, and their coexistence in an individual increases the risk of many possible long-term complications. Insulin resistance is an important common link between diabetes and hypertension. However, their relation is not very well understood.

Objective:- The main objective of this study was to assess the relation between DM and Hypertension among adults population in Jeddah city, Saudi Arabia.

Method:- A randomized Cross-sectional study was conducted in Al Balad, A historic festival in Jeddah city, Saudi Arabia. A questionnaire, weight and height scales were used to collect the data of demographic and anthropometric characteristics, and risk factors.

Results:- Total of the 3230 adult respondents, (54.5%) were females, and (83.3%) were Saudis. The majority of participants were 35 years and younger (68%), followed by the age group of 36-49 years old (19%). 12% of respondents have hypertension, 85.1% of whom were Saudi, with a slight female predominance (50.4%). Family history of hypertension was reported from 69.7%. Analysis of the data showed a higher risk of hypertension diagnosis with a positive family history (OR=1.69, 95% CI=1.30-2.19; P=.000). 10% of participants reported to have DM, 78.1% of whom had a positive family history of DM. Statically significant convergence was seen in those with family history of hypertension and family history diabetes mellitus (P < 0.001).

Conclusion:- This study showed a statistically significant correlation between DM and hypertension, beside their widely distribution. Thus, periodic health examinations and action should be taken by stakeholders to decrease the onset and the short – long term complications of the diseases, also increase the level of awareness in the society as well as lifestyle optimization which remains the cornerstone in the prevention and treatment of diabetes and hypertension.

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Introduction:-

Diabetes mellitus is a combination of metabolic disorders characterized by high blood glucose due to impair insulin secretion, action or both of them. Long-term hyperglycemia associated with chronic damage, failure and dysfunction of many organs, like the kidneys, heart, eyes, blood vessels and nerves. ⁽¹⁾ Cases of diabetes have 2 etiopathogenic types. Type 1 DM "diabetes

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mellitus" characterized by pancreatic β -cells destruction by the autoimmune system. Individual with high risk to type 1 can be identified by genetic markers and serologically by the presence of abnormal autoimmune process in the islets of pancreas. On the other hand, the common type, type 2 DM, it develops as a result of increasing the peripheral insulin resistance and compensatory defect in insulin secretion. ⁽²⁾ Risk factors of DM include genetic predisposition, over-weight, obesity, family history of DM, dyslipidemia, hypertension, decrease exercise, ethnicity and environmental factors. In 2011, a published systemic review studied the prevalence of some of the DM risk factors in the gulf ⁽³⁾, reported a very high prevalence of obesity and overweight (13-50% and 25-50%) respectively, it also detects a prevalence of high level of dyslipidemia (2.7 – 51.9%) and hypertension (6.6 – 33.6%). ⁽⁴⁾

This prevalence of obesity in the gulf area is higher than the population of Caribbean and North America as well as the European population. There has been a shift in die habits in the last few decades driven by a change in life-style and socio-economic status within the Region. These changes affect physical activity, diet and the prevalence of obesity which all lead to a rise in both impair glucose tolerance and diabetes. ⁽⁴⁾ According to international diabetes federation (IDF), there is globally over 336 million people affected with diabetes and, by 2030, the number will grow further to reach 552 million. ⁽⁵⁾ In the Middle East and North Africa (MENA), last decades had shown a dramatically rise in the prevalence of DM. Now a day, MENA region countries have the highest rate of diabetes mellitus in the word (KSA has 23.9%, Kuwait has 23.09%, Qatar has 22.9%, Bahrain has 21.9%. ^(6,7)). This due to many factors including rapid economic development; change in life-style by increase the consumption of refined carbohydrate, decrease the level of physical activity and increase obesity; and the population age. ⁽⁴⁾

Diabetes or glucose intolerance was found to be in association with hypertension ^(8,16). hyperinsulinemia is responsible for developing glucose intolerance as well as obesity. Hypertension is about twice as frequent in individuals with diabetes as in those without. ⁽¹⁷⁾ Increase in insulin level has been described as the pathogenic role in obese hypertension through increase the level of sodium retention in the kidney. ⁽¹⁸⁾

Most patients with type 2 diabetes are insulin resistant, and about half of those with essential hypertension are insulin resistant .Therefore, insulin resistance is an important common link between diabetes and hypertension. ⁽¹⁹⁾

However, there are few studies assessing the response of insulin on hypertension. ⁽²⁰⁾ In these analyses, we evaluated the association between diabetes mellitus and hypertension.

Material And method:-

In this study ,the research population included 3230 Saudi and non-Saudi respondents , 383 of whom diagnosed with hypertension (11.9 %) ,while 314 (9.7%) were diabetic patients.

This study is a randomized cross sectional study . Recruitment occurred in Jeddah city ,Kingdom of Saudi Arabia (KSA) at al-Balad – A historic Jeddah festival during the month of Ramadan at the time period of 6/6/2016 – 3/7/2016 . A total of 3230 respondents were interviewed , 54.5% of them were females while males represent 45.5 % of the study . Saudis were the majority of our study by 83.3% and 16.7% were non Saudi respondents. Alcohol consumption and the Jeddah residents staying less than 5 years were excluded from the study .A questionnaire that contains participant's demographics and anthropometric data (Age and sex data were collected ,Anthropometric data were measured in light clothing and bare feet and the measurements was used to calculate the subject's body mass index (BMI)) , nationality , marital status , educational level ,employment , medical insurance , smoking status , energy drinks , regular exercise status , history of DM , History of HTN , Family history of HTN , investigations for blood sugar level , lipid profile and BP check- up . Weight and height scales were used to collect the data of anthropometric characteristics, as well as risk factors been assessed , and diseases-related details.

Statistical analysis:-

Descriptive statistics were performed , P-value (P <0.001) was considered significant.

Result and Discussion:-

Generally, in 3231 responders 45.5% males and 54.5% females (85% of the participants were Saudis) with different age groups 68% were 35 years and younger, 19% were from 36 to 49 years, 10% between (50 to 64) year old and 6% 65 year and older.

Hypertension was found in 12% of the participants, with a slight female predominance ;50.4% were females and 49.6% were males, the majority of them were Saudis 85.1%. Family history of hypertension has been reported from 69.7%.

Analyzing data shows higher chance to diagnose with hypertension if there was positive family history (OR=1.69,95%CI=1.30-2.19; P=.000).

On the other hand, diabetes mellitus found to be in 10% of the participants with 78.1% family history of diabetes. 62.2% of the participants undergo investigational checkup of their blood sugar, blood pressure and cholesterol.

Recent major community-based studies have reconfirmed older observations on the increased rate of hypertension in overt diabetes. The association has been shown to be independent of, and additive to, the one expected due to obesity and age ^{(11),(12),(14-16)}

In this study, we demonstrated the association of DM and hypertension among respondent's family history of coexisting DM and HTN by 26.8 % with taking into consideration the convergent percentages between people affected with hypertension and people affected with diabetes, convergent is seen in those with family history of hypertension and family history diabetes mellitus with statistically significant P-value of <0.001 .

The baseline characteristics of the respondents.

Variable	Category	N	%
		Total = 3230	
Age	35 AND YOUNGER	2198	68
	36-49	606	18.8
	50- 64	332	10.3
	65 AND ABOVE	20	0.6
	Missing	74	2.3

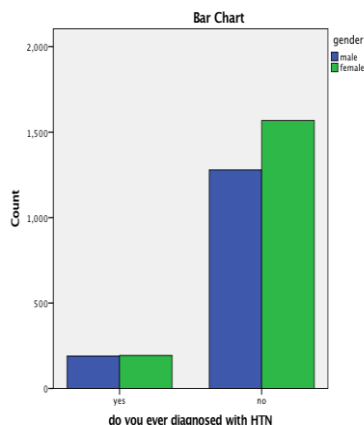
BMI	<18.5	182	5.6
	18.5-24.9	1145	35.4
	25-29.9	948	29.3
	30-39.9	645	20
	>39.9	151	4.7
Gender	Male	1469	45.5
	Female	1761	54.5
Nationality	Saudi	2691	83.3
	Non-Saudi	539	16.7
Marital status	Single	1600	49.5
	Married	1556	48.2
	Divorced	74	2.3
Educational Level	Elementary school	58	1.8
	Intermediate school	132	4.1
	High school	766	23.7
	Bachelor degree	2038	63.1
	Higher education	236	7.3
Employment	Student	1240	38.4
	Employed	1207	37.4
	Non Employed	783	24.2
Medical Insurance	Yes	1518	47
	No	1712	53
Smoking Status	Yes	830	25.7
	No	2400	74.3
Energy Drinks?	Yes	750	23.2
	No	2480	76.8
HTN	Yes	383	11.9
	No	2847	88.1
DM	Yes	314	9.7
	No	2916	90.3
Exercise Regularly	Yes	1885	58.4
	No	1345	41.6
investigate blood Glucose or Cholesterol or BP?	Yes	2009	62.2
	No	1221	37.8
Family History of HTN	Yes	2250	69.7
	No	960	29.7
	Missing	20	0.6

Any one of your family diagnosed with this diseases?

Category	N	%
	Total = 3230	
No diseases	327	10.1
DM	406	12.6
HTN	188	5.8
DM, HTN	866	26.8

Do you ever diagnosed with HTN * gender?

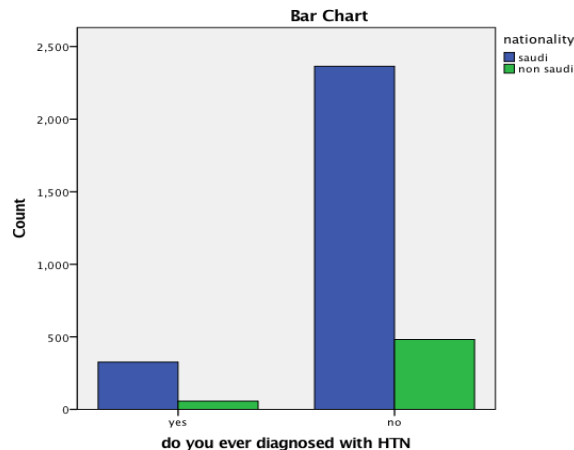
		Gender		Total
		Male	Female	
do you ever diagnosed with HTN	yes	190	193	383
	no	1279	1568	2847
Total		1469	1761	3230



Do you ever diagnosed with HTN * nationality

	Nationality		Total
	Saudi	Non Saudi	

Do you ever diagnosed with HTN	yes	326	57	383
	no	2365	482	2847
Total		2691	539	3230



(Reference of the discussion: interview with dr. emanashgar).

Conclusion:-

Our study demonstrates the relation between hypertension and diabetes mellitus, which showed a statistically significant correlation between them, beside their widely distribution. Thus, periodic health examinations and action should be taken by stakeholders to decrease the onset or the complications of the diseases, and increase the level of awareness in the society especially to those with high risk and lifestyle optimization which remains the cornerstone in the prevention and treatment of diabetes and hypertension also reinforcement of prevention programs and encourage the education campaigns to help rising the awareness level of the society in handling such diseases for early detection and management .

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