Hba1c in the Al-Najaf governorate and the impact of marital status and depression

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1- BACKGROUND

HbA1c , or glycated hemoglobin, has become the gold standard for evaluating glycemic management in people with diabetes [1]. Diabetes has been diagnosed for many years using random glucose or fasting glucose as the glucose standards. Although HbA1c was initially used in 2010 as a diagnostic criterion for diabetes at a cutoff of 6.5%, pre-diabetes between 5.7% and 6.4%, and normal 5.7% [2]. Haemoglobin, which is found in red blood cells, is a protein that carries oxygen and contains iron. The typical form of haemoglobin found in adults, called HbA, consists of a haem component and two chains of globin, known as the α and β chains (α2β2). making up just about 97% of adult haemoglobin [3]. Approximately 6% of HbA is glycated; the majority of this is HbA1c (5%), with tiny amounts of HbA1a and HbA1b (1% each) [4]. Glycation, a nonenzymatic process that results in the covalent attachment of glucose to the N-terminal valine of the hemoglobin -chain, is what causes HbA1c [5]. Marriage can improve a person's general health, including their ability to control their blood sugar levels, as it serves as a social and emotional support system. A study found that married people had significantly lower HbA1c levels than single people [6]. Another study looked at the association between HbA1c levels and the quality of marriage. Even after adjusting for age, sex, the length of the diabetes, medication use, and other health characteristics, the study revealed that better marital satisfaction was associated with lower HbA1c levels in both couples. The researchers hypothesized that healthy relationships could encourage greater self-care and wellness practices, which would improve glycemic management [7].

2: MATERIALS AND METHODS

The Subjects in present study were included eighty five (85) Subjects were contained forty three (43) normal married men and forty two (42) normal unmarried men were obtained from different places in Al-Najaf province/ Iraq. Smokers and people with heart disease, diabetes, arthritis and bone disease are excluded. The current study included age, Goldbergs depression scale and BMI . Goldberg Depression Test is an 18-question screening tool for depression. It was done for most subjects [8].GH-900Plus HbA1c Analyzer was used to measuring HbA1c , this analyzer work in HPLC Technology the gold standard methodology of HbA1c detection. All data were analyzed by the SPSS software (V.28 Inc., Chicago, USA. Kolmogorov-Smirnov test for variables distribution. Normally distributed Numerical Variables were compared between two groups by independent t-test, and ANOVA for compared among three or more groups. All data expressed as (mean ± SD) standard deviation.

3- RESULTS

3. 1. Comparison of HbA1c between the unmarried and unmarried males

In the figure (3-1) the results indicated that there was no significant difference (p value= 0.345) in the HbA1c (%) when compare between the unmarried males (6.42±1) and married males (6.7±1.65).

3.2. Comparison of HbA1c levels between depressed and non-depressed males

In the figure (3-2) the results indicated that there was no significant difference (p value= 0.081) in the HbA1c (%) when compare between the non-depressed males (6.45±1.39 %) and depressed males (6.95±1.27).

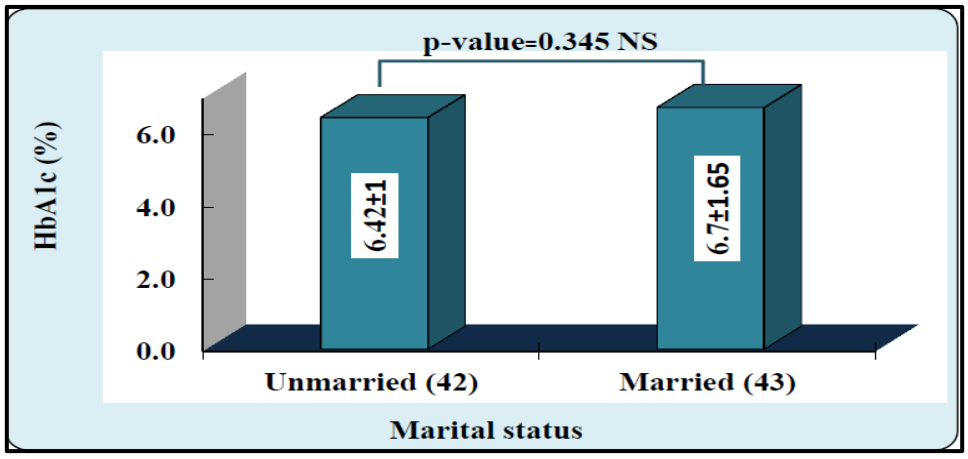

Figure (3-1): Comparison of HbA1c (%) between married and unmarried males. Values are expressed as mean ±SD.

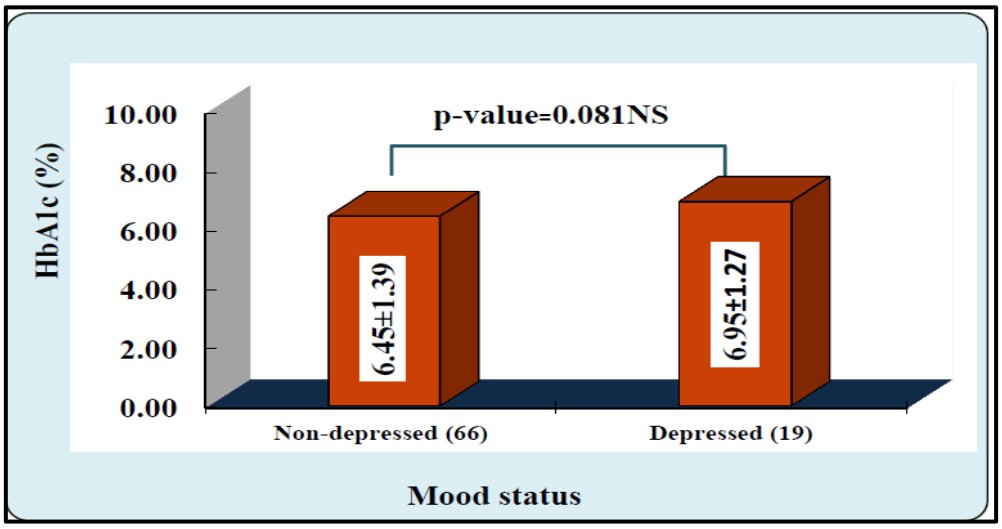

Figure (3-2): Comparison of HbA1c (%) between depressed and non-depressed males. Values are expressed as mean ±SD. *Significant differences at p-value <0.05.

3.3. The effects of marital status on HbA1c in depressed and non-depressed males

The results in table (3-1) showed that the depressed unmarried males have a significant (p-value=0.004*) increase in HbA1c (%) which estimated as (6.99±1.31%) as compared with non-depressed unmarried males (6.10±0.60%), and the results indicated that a non- significant difference between depressed married males (6.80±1.26 %) and non- depressed married males (6.69±1.70 %), (p-value=0.898).

Table (3-1): Comparison the effects of the marital status on HbA1c in depressed and non-depressed males

Study Variables	Marital status / Mood Status	Unmarried (means±SD)	p-value	Married (means±SD)	p-value
HbA1c (%)	Non-depression	6.10±0.60	0.004*	6.69±1.70	0.898
	Depression	6.99±1.31		6.80±1.26	

3.4. Comparison of HbA1c according to BMI classifications

The results of the effects of BMI on the study parameters are presented in table (3-2), the results indicated that there was insignificant increase (p-value=0.726) in HbA1c (%) in overweight (6.59±1.65%) and obesity (6.80±1.44%) group compared with underweight (6.25±1.01%) and normal weight (6.43±0.97%) respectively.

Table (3-2): Comparison the effects of the BMI on HbA1c

Study parameter	Underweight n=10	Normal weight n=22	Overweight n=32	Obesity n=21	p-value
HbA1c (%)	6.25±1.01	6.43±0.97	6.59±1.65	6.80±1.44	0.726

3.5. Studying the effect of the interaction between marital status and BMI on HbA1c

The results of the interaction between marital status and BMI on presented in table (3-3), showed that the increase in body mass is associated with a non-significant differences in the level of HbA1c (%) in both married and unmarried males.

Table (3-3): Comparison the effects of the interaction between marital status and BMI on HbA1c

Variables	BMI Classification	Unmarried	Married	Multivariate p-value
HbA1c (%)	Underweight	6.62±1.14	5.70±0.45	0.653
	Normal weight	6.42±1.11	6.45±0.73	
	Overweight	6.05±0.51	6.87±1.96	
	Obesity	6.69±1.14	6.91±1.77	

3.6.1. Correlation between HbA1c with Age in unmarried males

The results of the interaction between age and HbA1c were presented in table (3-4), the results showed that is no associated the level of average HbA1c with age in unmarried males

Table (3-4): Correlation between HbA1c with Age in unmarried males

Biochemical& Immunological Parameter		Age (years)
HbA1c (%)	R	0.031
	p-value	0.848

3.6.2. Correlation between HbA1c with Age in married males

Results of study in table (3-5) showed a significant positive correlation ($r= 0.399^{**}$, p=0.008) between HbA1c and age.

Table (3-5): Correlation between HbA1c with Age in married males

Biochemical& Immunological parameter		**Age (year)**
HbA1c (%)	**r**	0.416^{**}
	p-value	0.006

4- DISCUSSION

In the figure (3-1) the results indicated that there was no significant difference (p value= 0.345) in the HbA1c (%) when compare between the unmarried males (6.42±1) and married males (6.7±1.65). HbA1c test results suggest that marriage is not a significant factor in the development of high blood sugar levels or the risk of developing diabetes. However, it is possible that being married may lead to better dietary habits due to the observation and support of one's spouse, as well as the psychological stability that comes with a committed relationship, which could ultimately lead to better blood sugar regulation. These findings have been supported by several previous studies. In glycated hemoglobin, marital status, level of education, and socioeconomic status were not substantially different [9]. There were no discernible changes in HbA1c across any of the other factors gathered, especially marital status [10]. Compared to those who had never been married, were divorced, or had been widowed, those who were married had considerably lower HbA1c levels [11]. According to (Ford & Robitaille, 2023), marriage was linked to reduced HbA1c levels [12]. And those who lived alone on average had a higher HbA1c than those who did not [13]. In the figure (3-2) the results indicated that there was no significant difference (p value= 0.081) in the HbA1c (%) when compare between the non-depressed males (6.45±1.39 %) and depressed males (6.95±1.27). For instance, a study revealed no statistically significant association between HbA1c and PHQ-9 levels [14]. Nevertheless, other studies have indicated a positive correlation between the two variables. A study found that high HbA1c levels were associated with depression, but not anxiety [15]. Dehesh et al. (2020) also found a link between depression and elevated HbA1c levels [16]. In elderly individuals with type 2 diabetes, Zahra et al. (2022) found a significant correlation between depression and HbA1c levels [17]. The results in table (3-1) showed that the depressed unmarried males have a significant (p-value=0.004*) increase in HbA1c (%) which estimated as (6.99±1.31%) as compared with non-depressed unmarried males (6.10±0.60%), and the results indicated that a non- significant difference between depressed married males (6.80±1.26 %) and non- depressed married males (6.69±1.70 %), (p-value=0.898). These results confirm that marriage has a positive effect in covering the effects of depression on HbA1c, this was supported by previous studies. According to a study, lower HbA1c was most commonly correlated with family and composite support measures[18]. Increased HbA1c was linked to getting older, living alone, and having above-average levels of self-management [19].

The results of the effects of BMI on HbA1c presented in table (3-2), the results indicated that there was insignificant increase (p-value=0.726) in HbA1c (%) in overweight (6.59±1.65%) and obesity (6.80±1.44%) group compared with underweight (6.25±1.01%) and normal weight (6.43±0.97%) respectively. According to scientific research, there is a relationship between continuous high blood sugar levels and weight gain, as excess glucose can be converted into fat and stored in the body, potentially leading to an increase in body mass index (BMI). Many studies support our results. According to Sarnings et al. (2022) there was a substantial relationship between BMI and HbA1c [20]. The HbA1c level can be affected by obesity [21]. HbA1c levels were higher in the obese group, and there was a strong correlation between HbA1c and BMI [22]. According to recent research, a greater BMI is linked to higher HbA1c readings [23]. The results of the interaction between marital

status and BMI on HbA1c presented in table (3-3), the results showed that the increase in body mass is associated with a non-significant differences in the level of HbA1c (%) in both married and unmarried males. The results do not show any differences between married and single people, and this for our society, according to my opinion, is a positive indicator, because many of our society believe that married people eat more and are more prone to obesity and diabetes, but our study and other studies have proven that there is no difference between married and single people in terms of obesity. Results of study in table (3-4) showed insignificant correlation between HbA1c and age in unmarried male . while the results of study in table (3-5) showed a significant positive correlation ($r= 0.416^{**,}$ p=0.006) between HbA1c and age in married male. The connection of age with higher HbA1c levels was found in two large datasets using various methods to measure HbA1c [24]. Even in the absence of diabetes, HbA1c rises with age (Roth et al., 2016). HbA1c has positive relationships with age [25].

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