Assessment of Diabetes Risk And Nutritional Status: A Cross Sectional Epidemiological Study on Students of Graduation and Under Graduation From Guntur

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ABSTRACT

Background: This epidemiological study is to assess the diabetes risk and nutritional status and stating their association among healthy students of graduation and under graduation in between age 18 to 24 years. **Objectives:** To predict and assess the diabetes risk, nutritional status and assess the association between diabetes and nutritional status. **Methods:** The study was designed to be a cross-sectional study. It was conducted in students of graduation and under graduation in Guntur District, Andhra Pradesh over one month from 1st October to 1st November which includes 57 students. Students are enrolled based on Inclusion and exclusion criteria. Specially designed data collection form used to obtain the data required for the study. **Results:** In our study we collected data from 57 students out of the 31 (54.38%) were males and 26 (45.21%) were females. Diabetes risk assessed by using IDRS, AUSDRISK tool, nutritional status by Using MNA-SF and shown that malnutrition having impact on diabetes risk. **Conclusion:** We came to a temporary conclusion that most of the students have moderate to low risk of diabetes mellitus. Students who are at risk of malnourishment and malnourished having moderate to high risk of diabetes mellitus.

Key words: Diabetes risk, Nutritional status, IDRS, AUSDRISK, MNA-SF, Students.

INTRODUCTION

Asia is the hub of greater than 60% among the world's diabetic population. India occupies the highest prevalence of diabetes among Asia According to the International diabetes federation 11% of individuals with prediabetes develop Type 2 diabetes mellitus every year.[1] The young-onset of diabetes is more common nowadays. Most of the diagnosed young with a family history of diabetes and obesity and a sedentary lifestyle.[2] A well balanced and fulfilled diet is essential for growth and development in adolescence. Malnutrition among young in India is under-reported.[3] malnutrition is adjustable and thus adequate interventions and strategies should be developed and implemented. Our paper aims at assessing diabetes risk by using IDRS, AUDRA'S and screening of nutritional status by using MNA-SF[4] in the age group between 18 years to 24 years and to check whether there is any relation between nutritional status[5] and diabetes risk.[6]

MATERIALS AND METHODS

The study was designed to be a cross-sectional study. It was conducted in students of graduation and under graduation in Guntur district, Andhra Pradesh. This study was conducted over one month from 1st October to 1st November. Sample size was estimated assuming that 50% of students would have moderate to high risk score. Sample size was estimated using the formula 4pq/L, where prevalence (p) = 50%, q = 50%, relative error (L) = 26% of prevalence and estimated sample size came out to be 57. Students were enrolled in the study based on Inclusion and Exclusion criteria. All healthy human male and female students, age

between 18 to 24 years, those who understand English and local language, students who are willing to participate in the study have been included in the study. Students with diabetes mellitus and other diseases, females who are pregnant are excluded from the study. All enrolled students gave Informed consent. Data collection form designed by using IDRS, AUDRAT and MNA-SF.

Study procedure

The students were enrolled for a study by a simple random sampling method from various colleges across Guntur, Andhra Pradesh. The students were categorized into male and female. Data collected from a pre-designed data collection form.

Statistical analysis

Categorical data represented as numbers and percentages. Mean values are reported. Statistical analysis *t*-test, ANOVA, chi-square was carried out by using Microsoft excel 365.

RESULTS

A cross-sectional observational study was conducted in Guntur district, Andhra Pradesh for one month. The data was collected form a total of 57 based on inclusion and exclusion criteria.

In our pilot study, we screened 57 students for diabetes risk and nutritional status. Out of 31 students (54.39%) were males and 26(45.61%) were females, results shown in Figure 1.

By using the IDRS scale the score was calculated and interpreted the Diabetes risk. The maximum score is 70 and the minimum score is 0.overall average IDRs score is 27.89474. The final assessment has been done and found that 2(3.508%) of students are at High risk of diabetes, out of which female students are 1(1.754%), male students are 1(1.754%). 29(50.877%) of students are at Moderate risk of diabetes, out of which female students are 13(22.807%), male students are 16(28.070%). 26(45.61%) of students are at Low risk of diabetes, out of which female students are 12 (21.052%), male students are 14(24.5614%). Results have been shown in Figure 2.

Students Diabetes risk assessment using AUSDRISK

By using the AUSDRISK score was calculated and interpreted the Diabetes risk. The maximum score is 22 and the minimum score is 2. Overall average AUSDRISK score is 8.350877. The final assessment has been done and found that 3 (5.263%)of the students are at High risk of diabetes, out of 15 high-risk students female students are 2 (3.508%), male students are 1 (1.754%). 27 (47.36%)of students are at moderate risk of diabetes, out of 27 intermediate-risk students female students are 10 (17.543%), male students are 17 (29.824%). 15 (26.31%) of students are at Low risk of diabetes, out of which female students are 14 (24.561), male students 13 (22.807). Results have been shown in Figure 3.

Student's nutritional screening and final nutritional status assessment using MNA-SF

By using the MNA-SF questionnaire data was interpreted. The screening results showed out of 26 females, 10 (17.543%) are malnourished, 16 (28.070%) are at risk of malnutrition. Out of 31 males, 8 (14.036%) are malnourished, 21 (36.842%) are at risk of malnutrition, 2 (3.508%) are with normal nutritional status. Results are shown in Figure 4(a).

In the MNA-SF final nutritional assessment it is reflecting that out of 26 females 14 (24.562%) are malnourished, 12 (21.052%) are at risk of malnutrition. Out of 31 males 10 (17.543%) are malnourished, 21 (36.842%) are at risk of malnutrition. When compared to males females are
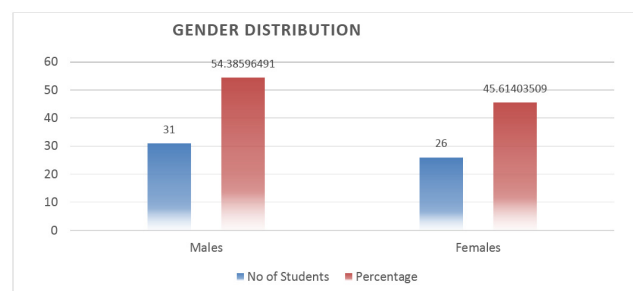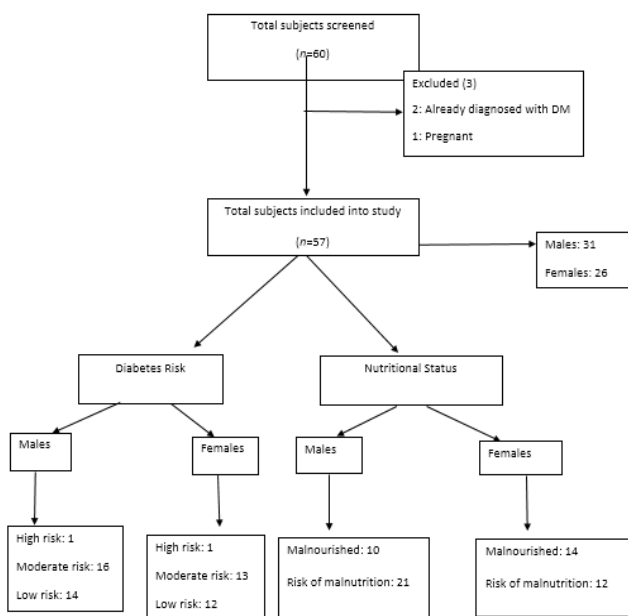

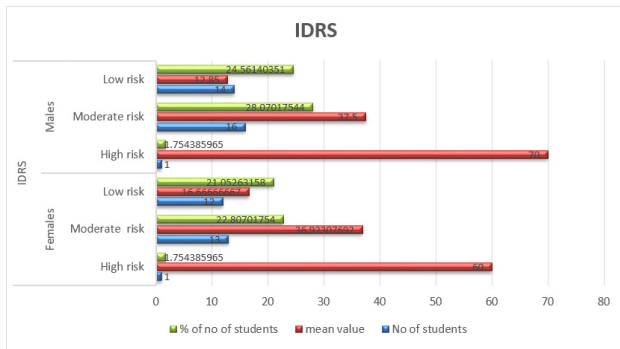**Figure 1: Students Diabetes risk assessment using IDRS**

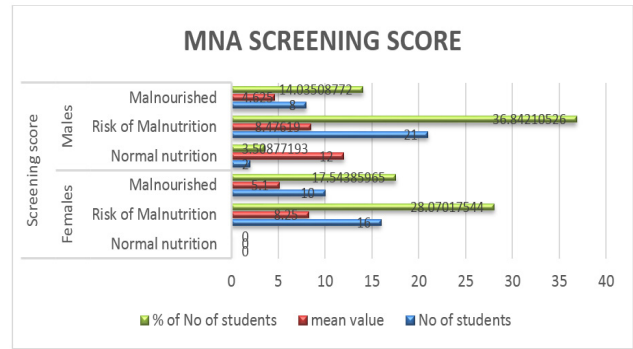Figure 2: Students IDRS risk interpretation.

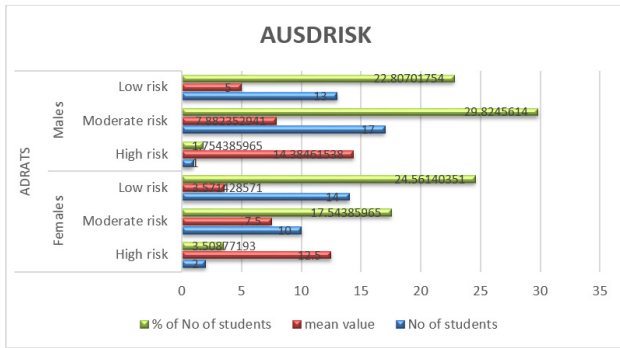Figure 4: (a) Students MNA screening score interpretation.

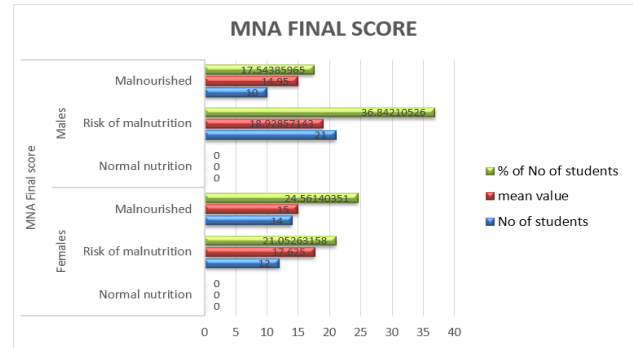Figure 3: Students Diabetes risk assessment using AUSDRISK.

Figure 4: (b) Students MNA final score interpretation.

Table 1: *t*-Test: Two-Sample Assuming Unequal Variances.

	IDRS	AUSDRISK
Mean	27.89474	8.350877
Variance	227.6316	19.4104
Observations	57	57
Hypothesized Mean Difference	0	
Df	65	
t Stat	9.387769	
P(T<=t) one-tail	5.17E-14	
t Critical one-tail	1.668636	
P(T<=t) two-tail	1.03E-13	
t Critical two-tail	1.997138	

Table 2: ANOVA: Single Factor.

Groups	Count	Sum	Average	Variance
IDRS	57	1590	27.89474	227.6316
AUSDRISK	57	476	8.350877	19.4104
ANOVA				
Source of Variation	SS	df	MS	F
Between Groups	10885.93	1	10885.93	88.1302
Within Groups	13834.35	112	123.521	
Total	24720.28	113		

having more chances of malnutrition. Results are shown in Figure 4(b).

Significance testing between IDRS and AUSDRISK

The conclusion from the *t*-test (Table 5) between IDRS and AUSDRISK is the difference between IDRS and AUDRAT's is not significant which is depicted with '*p*' value in Table 1. One way ANOVA between IDRS

and AUSDRISK further revealed there is no significant difference. Table 2.

Correlation BETWEEN IDRS and AUSDRISK's with MNA

The correlation between IDRS and AUSDRISK's with MNA checked individually (Table 3). The test between IDRS and MNA showed a positive relation while AUSDRISK's with MNA resulted in Negative correlation.

Table 3(A): z-Test: Two-Sample for Means.			Table 3(B): z-Test: Two-Sample for Means.		
	IDRS	**MNA**		**AUSDRISK**	**MNA**
Mean	27.89474	16.99123	Mean	8.350877	16.99123
Known Variance	227.6316	4.566886	Known Variance	8.350877	4.566886
Observations	57	57	Observations	57	57
Hypothesized Mean Difference	0		Hypothesized Mean Difference	0	
z	5.402242		z	-18.1499	
P(Z<=z) one-tail	3.29E-08		P(Z<=z) one-tail	0	
z Critical one-tail	1.644854		z Critical one-tail	1.644854	
P(Z<=z) two-tail	6.58E-08		P(Z<=z) two-tail	0	
z Critical two-tail	1.959964		z Critical two-tail	1.959964	
Pearson correlation	0.1628		Pearson Correlation	-0.0101	

Table 4(A): IDRS.

	Actual Values			
	High risk	**Moderate risk**	**Low risk**	**Grand total**
Females	60	36.92308	16.66667	113.5898
Males	70	37.5	12.85	120.35
Grand Total	130	74.42308	29.51667	233.9398
	Expected Values			
	High risk	**Moderate risk**	**Low risk**	
Females	63.12168	36.13623	14.33186	
Males	66.87832	38.28685	15.18481	
	P	0.584861		

Table 4B: Table 4B: AUSDRISK.

	Actual Values			
	High risk	**Moderate risk**	**Low risk**	**GRAND TOTAL**
Females	12.5	7.5	3.571429	23.57143
Males	14.38462	7.882353	5	27.26697
Grand total	26.88462	15.38235	8.571429	50.8384
	Expected Values			
	High risk	**Moderate risk**	**Low risk**	
Females	12.46516	7.132089	3.974178	
Males	14.41946	8.250261	4.597205	
	P	0.945693		

Table 4(C): Mna final score.

	Actual values			
	Normal nutrition	**Risk of malnutrition**	**Malnourished**	**Grand Total**
Females	0	17.625	15	32.625
Males	0	18.92857	14.95	33.87857
Grand total	0	36.55357	29.95	66.50357
	Expected Values			
	Normal nutrition	**Risk of malnutrition**	**Malnourished**	
Females	0	17.93227	14.69273	
Males	0	18.6213	15.25727	
	P	0.879587		

Thus indicating malnutrition increases diabetes risk in a correlation between AUSDRISK's and MNA.

The difference among different genders in risk assessment

Chi-square test applied to IDRS, AUSDRISK's and MNA. Test statistic revealed the there is no significant difference among genders in relation to any scale as shown in the above (Table 4).

DISCUSSION

As the prevalence of diabetes rises and more young adults and children develop T2DM, it is crucial from a clinical and public health perspective to be able to identify high-risk population. Finding effective measures to assess the risk of T2DM is a crucial public health priority. Various countries and different studies have used various diabetes risk scores to predict diabetes risk, diabetes risk assessment scores available like Dutch Diabetes Risk Score,[7] Finnish Diabetes Risk Score,[8] German Diabetes Risk score[9] using different variables. Fernandez R, in their study reported that 28% of individuals are at low-risk and 35% are having moderate-risk according to AUSDRISK.[10] Vijaykumar V in their study reported that 23.13% were at high risk, 32.5% at medium risk and 44.38% at low risk of T2DM as per the IDRS.[11] Our study mainly focuses on assessing the risk of diabetes among the youth and to know the contributing risk factors included in the tools we used. The scales which we have used for our study were cost effective. There are many MNA scoring studies done by Saeidlou *et al.,* Domini *et al.* and Boulos *et al.* found marked association between female gender and nutritional status carried out in elderly population.[12] In our study we have used IDRS, AUSDRISK to assess the diabetes risk and MNA for nutritional status assessment respectively. Our results suggest that there exists no significant difference between IDRS, AUSDRISK, where factors like ethnicity, social history and medication history added an extra benefit in terms of public concern and can be considered a good screening tool for detecting risk of T2DM in a young Indian, population. In order to assess the nutritional status we have used MNA and results shown a negative correlation with AUSDRISK indicating malnutrition increases risk of T2DM, with the present results, above half of the student population is at moderate risk of diabetes where the nutritional status, dietary patterns, physical activity seems to be the major contributing factors. In our study it was observed that 3.5%, 50.87% and 45.61% of students in High, Moderate and Low-risk group, respectively, for developing T2DM. The mean abdominal obesity in high-risk students was 3.859± 5.90 as compared to 8.59±5.80 in moderate and low-risk students (*P*< 0.0001). 63% of the students were having a sedentary lifestyle. A positive family history of type 2 diabetes mellitus in either or both parents was observed in 25% of students. Results of the MNA scale have shown that 2 students were normal or well-nourished after the screening and no student falls under normal nutrition after the final assessment with MNA, risk of malnutrition is high in males than in females, several students with malnourishment present with the difference of 7.01% high in females when compared to males.

Our study was done as a sample study to understand the results and necessity to carryout in larger samples. Since, there are no existing studies based on our concept we have used this study for knowing the sample size further and to know the status of nutrition clearly with large sample. All the necessary statistical tools were applied to find the difference and association between the scales, the results show a negative correlation between ADRAS and MNA, but no association between the IDRAS and MNA deviating the null hypothesis. Hence the study extended with a large sample size for precise results. To our knowledge, this is the first study which has investigated diabetes risk with the use of IDRS, AUSDRISK and malnutrition with MNA in a young student population and stating the association between risk of type 2 diabetes mellitus and malnutrition in the South India, Andhra Pradesh.

Strengths

The scales we have used in our study were cost effective, less time consuming and the questionnaire were easy to understand.

Limitations

Less sample size and no supportive measurements for the study.

CONCLUSION

From this pilot study, we came to a temporary conclusion that most of the students have moderate to low risk of diabetes mellitus with high abdominal obesity and family history when it is assessed with IDRAS. When assessed with ADRAS and MNA, students who are at risk of malnourishment and malnourished having moderate to high risk of diabetes mellitus. Hence, it is required to know the association between malnutrition and developing T2DM starting from young age, in order to take necessary measures to reduce the rate of incidence in developing countries like India.

ACKNOWLEDGEMENT

CONFLICT OF INTEREST

The authors declare no Conflict of Interest.

ABBREVIATIONS

IDRS: Indian Diabetes Risk Score; **AUSDRISK:** Australian Diabetes Risk; **MNA:** Mini Nutritional Assessment.

SUMMARY

- Diabetes is the burning disorder in North India.

- Young onset of diabetes due to lifestyle.

- Assessment of Diabetes risk in Young.

- Nutritional status of college students.

- Impact of Nutrition On Diabetes risk.

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