



Research Paper

Assessment of Trend and Prevalence of Risk OG Diabetes and Its Risk Factor as Per Indian Diabetic Risk Score among Indian Student Population: A Systematic Review And Meta Analysis

Dr Kailash S, Pharm.D¹
Dr Sutheshwaran G, Pharm. D
Dr Vineth Matin J, Pharm. D
Dr Dinesh Kumar C, Pharm. D
Corresponding Author: Dr. Kailash S

ABSTRACT:

Objective The purpose of this paper is to perform a systematic review and a meta analysis in order to summarise the trend and prevalence of risk of diabetes and its risk factors such as family history, physical activity and abdominal obesity among the young Indian student population, specifically focused on university students as per Indian Diabetic Risk Score(IDRS).

Design Systematic review and meta-analysis.

Participants University students of india

Data sources Pubmed, Medline, Embase, Science Direct, Scopus, Cochrane Library and web of science were used to search for the studies, published between 1st January 2010 to 1st January 2021 which focused on the assessment of risk of diabetes among young Indian population. Articles published in English were only taken into consideration . The selected articles were assessed for quality by two independent authors.

Results Out of 29 potentially significant studies, 12 studies were only included which together has a population size of 4986 and proportion meta analysis were performed. The pooled prevalence of risk of diabetes was 54.924%(95% CI: 53.532-56.311) and the pooled prevalence of risk factor as per IDRS such as family history was 12.768(CI 95%,7.347 – 19.416), physical activity was 51.988(95% CI, 40.88 – 63.755)and abdominal obesity was 30.84% (95% CI, 23.72 – 38.4) Finally the over all temporal trend of risk diabetes was also increased from 33% to 66 % from the period of 2010 to 2022

Conclusion This meta analysis suggest a relatively increasing trend of the diabetic risk and it's risk factors among the young student population. Further studies is needed in order to identify the reason behind this increasing trend of risk of diabetes and our study also provides valuable insights to the health care professionals and policy makers to identify strategies for early detection and prevention of diabetes and its modifiable risk factors

KEYWORDS: Indian Diabetic Risk Score, Risk of Diabetes, Student Population, Trend and prevalence

PROSPERO : Not Registered

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I. INTRODUCTION

Diabetes is the major Public health concern in India among other various conditions and is recognised as one of the leading cause of morbidity and mortality. According to the 2019 estimates of international diabetic federation, india has the second largest number of people with diabetes in the world, with more than 77 million affected by this condition¹. The rising prevalence of diabetes is associated with the serious of health complications, including cardio vascular disease, stroke, renal disease, cataract and amputation²

Mohan et al ³ founded the Indian diabetic risk score(IDRS) which has been a most widely used in india and has shown to be the most accurate and reliable tool for identifying individuals who are at the risk of diabetes. IDRS is a simple, cost effective and validated tool that can be used to asses the risk of diabetes by its risk factors which includes age , Family history of diabetes ,waist circumference, and physical activity. IDRS assess the individuals into low, moderate and high risk category by the scores given to the risk factors. Several studies have

been conducted across Indian in various timeline to assess the risk of diabetes among the Indian population by using IDRS. We found that that no comprehensive synthesis which specifically focused in the risk of diabetes on indian student population. Hence with this available information, our meta analysis will have a special focus on young student population as they are considered to be most vulnerable to the diabetes in future due to their sedentary life style with minimal physical activity. The aim of the meta analysis is to examine the prevalence of diabetic risk and its risk factor and to analyse its trend among the young student population of india. The insights of this meta analysis will be of the interest of the public healthcare policy makers, health care providers, and researchers working in the field of diabetes prevention and management in india.

II. METHODOLOGY AND RESEARCH

This systematic review and meta analysis followed the Preferred Reporting Items for the Systematic Reviews and Meta- Analysis (PRISMA Guidelines)

2.1 Literature search

A Comprehensive literature search swas conducted to identify the studies published between 1st January 2010 to 1st Jan 2023 on the assessment of risk of diabetes using Indian diabetic risk score. Study team also carried electronic searches using the following databases: Pubmed, Embase, Science Direct, Springler, Scopus, Cochrane library and Web of Science. The relevant studies were searched using following key words ‘risk of diabetes’, ‘ student population’, ‘Indian diabetic Risk Score’ as well as variations thereof. Snow ball search strategy method were also used in addition to search the reference list of the included studies

2.2 Inclusion and Exclusion criteria:

The inclusion criteria were follows:

The article

- a) Had sufficient data to estimate the risk of diabetes.
- b) Was published in English.
- c) Focused on young student population of india.
- d) Used IDRS as a tool to assess the risk of diabetes.
- e) Had a population size of at least 70.

The exclusion criteria were as follows:

The article

- a) Was irrelevant to risk of diabetes.
- b) Focused on validation of IDRS as a tool.
- c) Was a review article.
- d) Contained duplicate data(information).
- e) Contained data that were published in more than one article.

2.3 Outcome measures

A pre structured questionnaire based on IDRS were used get the information from the participants. It recorded the response containing positive diabetic history in either of the parents or in both the parents or negative family history of diabetes in the parents. It also assessed the physical activity and categorised them into sedentary, mild, moderate and high level. Anthropometric measurement was done in every studies to measure the waist circumference of the participants and to asses their level of abdominal obesity Overall based upon this parameters a score ranging from 0 to 100 were given and the participants were categorised into low, moderate and high risk category of diabetes

2.4 Data extraction

Our team identified the studies which can be eligible and to be reviewed in the full text. Each full text study was then reviewed for the eligibility by our team and was included in our study. Data were extracted using the Microsoft excel Version 2.71 (2023). Mutual consensus or consultation were done to resolve any disagreement occurred between the authors regarding the data extraction. The following data points were collected:

- I. First author
- II. Year of publication
- III. Study location
- IV. Number of participants involved in the study
- V. Number and percentage of participants with low, medium and high risk category as per IDRS
- VI. Number and percentage of participants in IDRS risk components such as Age, Family history, Waist circumference, Physical activity

The studies were arranged in the chronological basis starting form 2010 to 2021 to assess the temporal variation of prevalence and to analyse the trends.

III. STATISTICAL ANALYSIS

All statistical analysis were performed using the software MedCalc for Windows, version 19.4 (MedCalc Software, Ostend, Belgium).⁴ Proportion meta analysis were performed to assess the temporal prevalence. From the data extraction form the total number of participants, number of participants with risk (no of participants in moderate and high risk were combined) and with this Prevalence(Proportion) and Proportion % (prevalence %) were extracted from each study. Pooled prevalence were calculated by using random effect model, as the random effect were found to be more consistent and the Upper limit and lower limit of the confidence interval were also calculated⁴. The confidence interval of population proportion and with this data a forest plot will be constructed showing the prevalence(proportion) of the risk of diabetes in each study.

3.1 Test for heterogeneity⁴

The test for heterogeneity will be conducted and values be expressed as the quantity, which we call I^2 , describes the percentage of total variation across studies that is due to heterogeneity rather than chance. I^2 can be readily calculated from basic results obtained from a typical meta-analysis as $I^2 = 100\% \times (Q - df) / Q$, where Q is Cochran's heterogeneity statistic and df the degrees of freedom. Negative values of I^2 are put equal to zero so that I^2 lies between 0% and 100%. A value of 0% indicates no observed heterogeneity, and larger values show increasing heterogeneity

3.2 Test for Publication Bias⁴

For the robust detection of publication bias two test were included and will be presented in the reports. They were Egger's test and Begg's test. For both tests, when the (two-sided) P-value is low, this is an indication of publication bias.

Further more, a single line graph will also be attached to assess the trends of the risk of diabetes in a temporal period. We evaluated the symmetry of the funnel plots and considered Eggers' test to test for any publication bias. The same method will also be applied for the assessment of prevalence of IDRS risk components such as family history and and a multiline graph will be shown to assess the prevalence and trend of each risk factors from each study conducted in a different period of time across India.

IV. RESULTS

4.1 Literature search:

Our team initially identified 29 potential articles. After elimination of the duplicates 25 article remained. we screened the articles and abstracts and excluded 5 irrelevant article. We scrutinised the full text of remaining 20 articles, 7 of which were excluded for the following reasons, 3 articles did not mention the specific form of result required for the study, 5 articles included others with students as their participants. Hence, finally 12 article met the inclusion criteria and data were extracted accordingly. Study selection process are depicted in the flow diagram in figure 1

4.2 The characteristics of the included study

Table 1 shows the characteristics of the included studies. Every sample included in the study used cross sectional research design, the sample size varied from 76 * to 2523* participants. The articles were published between the period January 2010 to January 2021. Studies which were conducted on the undergraduate student population from various parts of india were represented in the selected articles: 2 studies were conducted in Karnataka*, 2 in Maharashtra, 1 in south India, 1 in Assam, 1 in Tamilnadu, 1 in Kolkata, 1 in northern india, 1 in Punjab, 1 in Punjab. Every study were conducted in health education institutions

Figure 1 shows the process of inclusion of studies in compliance with PRISMA

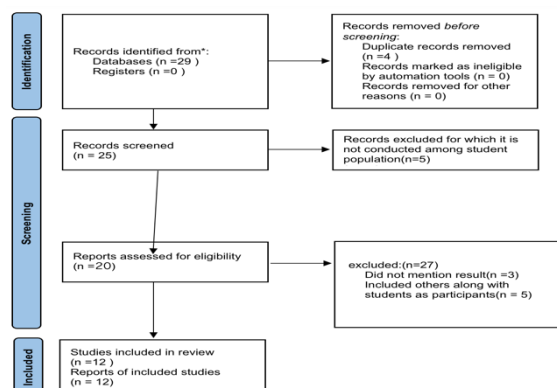


Table 1: Characteristics of the included study

Studies	Anand Vardhan et al ^F	Pranita Ashok et al ^E	S.S.Karakti et al ^F	Tarun Bhatia et al ^E	Darsan arathi et al ^F	Prasanth Kumar Bhattacharya et al ¹⁰	Gopal Krishnan S et al ¹¹	Murari M. Mandal et al ¹²	M.M.Singh et al ¹³	Suhash tetarwa y et al ¹⁴	Alan Jose Janga et al ¹⁵	Santhos Mahajan et al ¹⁶
Methodology used	Cross sectional study	Cross sectional study	Cross sectional study	Cross sectional study	Cross sectional study	Cross sectional study	Cross sectional study	Cross sectional Study	Cross sectional	Cross sectional study	Cross sectional study	Cross sectional study
Year	2011	2011	2011	2014	2015	2016	2017	2017	2019	2020	2020	2020
Study site	Mangalore Karnataka	Pune, Karnataka	Belgaum, Karnataka	Mumbai Maharashtra	South india	Gauhati, Assam	Chennai Tamil-Nadu	Kolkata West Bengal	Northern india	Jharkand	Guntur Andhra pradesh	Punjab
Population size(%)	150	261	76	222	200	646	251	130	290	135	2523	102
IDRS RISK COMPONENTS												
Age												
<35	150(100)	261(100)	76(100)	222(100)	200(100)	646(100)	251(100)	130(100)	290(100)	135(100)	2523(100)	102(100)
35-49(%)	0	0	0	0	0	0	0	0	0	0	0	0
More than or equal to 50(%)	0	0	0	0	0	0	0	0	0	0	0	0
Family history												
No family history (%)	131(87.6)	197(75)	49(64.47)	150(67)	147(73.5)	474(73.37)	134(53)	94(72.3)	237(81.72)	111(82.2)	1581(63)	86(84.3)
Either parents (%)	16(10.4)	5(2)	24(31.57)	65(29.2)	47(23.5)	154(23.84)	98(39)	30(23.1)	53(18.27)	21(15.56)	826(33)	16(15.7)
Both parents (%)	3(2)	59(23)	3(3.94)	7(3.15)	6(3)	18(2.786)	19(7.56)	6(4.6)	0	3(2.22)	116(4.59)	0
Abdominal obesity												
Waist < 80 cm in females, < 90 in males	137(91.3)	162(62)	63(82.90)	152(68.4)	128(64)	528(81.73)	93(37.05)	67(51.5)	217(74.82)	117(86.6)	1665(66)	60(58.8)
Waist> 80-89 cm (females), > 90-99 cm(males)	11(7.3)	61(23.37)	10(13.15)	55(24.77)	67(33.50)	96(14.8)	120(47.8)	40(30.8)	45(15.51)	18(14.3)	767(30.3)	32(31.4)
Waist >90cm(females), > 100 cm (males)	2(1.3)	38(14.55)	3(3.95)	15(6.756)	5(2.50)	22(3.40)	38(15.13)	23(17.7)	28(9.65)	6(4.44)	91(3.60)	10(9.8)
Physical activity												
No (%)		163(62)	28(36.68)	90(40.5)	43(21.5)	50(7.74)	20(7.96%)	27(20.8)	67(23)	72(53.3)	1188(47)	48(47.1)
Mild (%)	33(22)	73(28)	23(30.26)	10(4.50)	60(30)	249(38.54)	0	55(42)	93(32)	39(28.8)	0(0)	0
Moderate (%)	116(77.3)	25(10)	23(30.26)	23(10.36)	56(28)	285(44.11)	192(77)	43(33)	90(31)	24(17.7)	796(30.2)	39(38.2)
Strenuous activity (%)	1(0.7)	0	2(2.63)	9(4.05)	41(20.5)	62(9.59)	39(15.53)	5(3.8)	40(14)	0(0)	539(21.3)	15(14.7)
IDRS RISK CATEGORY												
LOW RISK	100(66.6)	52(19.92)	2(2.63)	68(31)	165(82.5)	488(75.5)	102(40.6)	58(44.6)	222(76.55)	111(82.2)	846(33.5)	36(35.3)
MODERATE RISK	50(33)	198(75.86)	71(93.42)	152(68)	33(16.5)	156(24.2)	144(57)	66(50.7)	67(23.10)	24(17.78)	1645(65)	66(64.7)
HIGH RISK		11(4.21)	3(3.94)	2(1)	2(1)	2(0.30%)	5(1.9)	6(4.6)	1(0.344)	0(0)	32(1.267)	0

4.3 The trend and prevalence of risk of diabetes in india among undergraduate student population by using Indian Diabetic Risk Score(IDRS)

The prevalence of risk of diabetes in india among university student population by using Indian Diabetic Risk Score (IDRS) is presented in table 2. The pooled prevalence was 51.311% (95% CI 36.657 – 68.8505, I² =98.86%). The graphical display of pooled prevalence is displayed in forest plot(see figure 2A). The funnel plot (see figure 2B) and the egger’s test (p= 0.4100) showed publication bias and the begg’s test also showed (P=0.5833) showed the same. A single line graphical representation (figure 2C)was constructed in order to show the trend of risk of diabetes among the student population. The results found that the prevalence had been increased from 33% in 2011 to 64% in 2020

*Corresponding Author: Kailash S , Pharm D

Table 2 prevalence of the risk of diabetes among student population of india

Study ID	Sample Size	Proportion(Prevalence %)	95% CL	Weight(%)
				Random effects
Anandh Vardhan et al., 2011	150	33.33	25.856 – 41.884	8.30
Pranita Ashok et al., 2011	261	80.077	74.708 – 84.748	8.39
S.S.Karikatti et al.,2011	76	97.386	90.815 – 99.680	8.11
Tarun Bhatia et al.,2014	222	69.369	62.850 – 75.363	8.37
Darshan Arathi et al.,2015	200	17.500	12.502 – 23.488	8.35
Prasanth Kumar Battacharya et al., 2016	646	24.458	21.189 – 27.963	8.45
Gopal Krishnan S et al.,2017	251	59.363	53.006 – 65.495	8.38
Murari M Mandal et al.,2017	130	55.385	46.417 – 64.107	8.27
M M Singh et al.,2017	290	23.448	18.693 – 28.755	8.40
Suhash Tetraway et al., 2020	135	17.778	11.375 – 25.587	8.28
Alan Jose Janga et al., 2020	2523	66.468	64.558 – 68.310	8.49
Santhosh Mahajan et al., 2020	102	64.706	54.620 – 73.914	8.29
Total (Random Effects)	4986	51.311	36.657 – 65.850	100
Test for heterogeneity				
Q = 968.7613 DF= 11 Significance level(P<0.0001 I2(inconsistency) = 98.58 to 99.09				
Publication bias Egger's test Significance level (P = 0.4100) Begg's test Significance level (P= 0.5833)				

Figure 2A shows the forest plot on proportion (prevalence) of risk of diabetes from the included studies

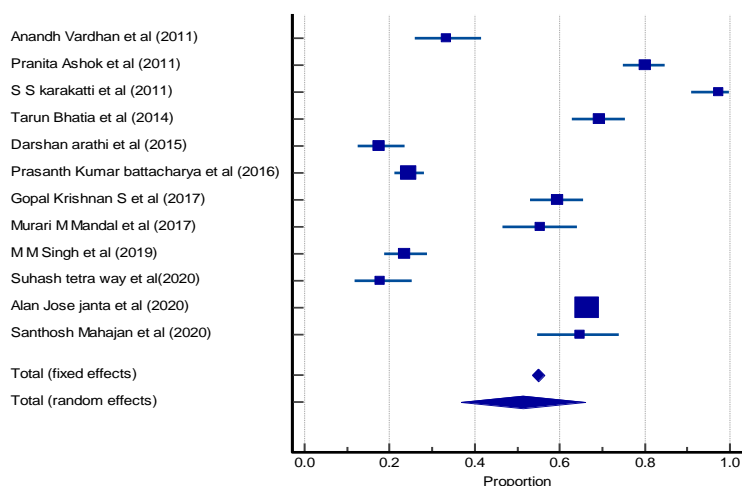


Fig 2B shows the funnel plot

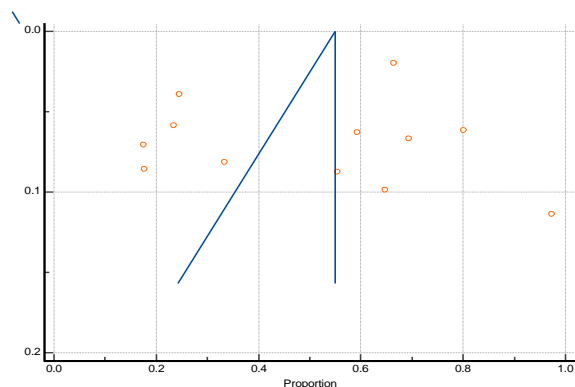
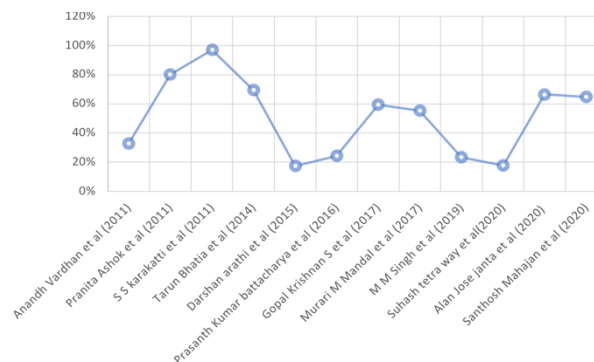


Figure 2C shows the trend of risk of diabetes



4.4 The trend and prevalence of risk factors of diabetes in india among undergraduate student population by using Indian Diabetic Risk Score Physical Activity

From the data extraction form for the included studies, the participants who had mild and no physical activity is considered as physical inactive and the prevalence of this risk factor was assessed. Table 3 shows the pooled prevalence with random effect 51.98% (95% confidence interval confidence interval of 40.88 - 63.775, $I^2= 98.25\%$). The graphical display on the pooled prevalence is displayed in forest plot(see fig 3A) and the egger’s test ($p=0.6441$), begg’s test ($P=0.2726$) showed significant publication bias and was shown in funnel plot to further assess the symmetry of the proportion of the included studies. Temporal trend of the physical inactivity (see figure B) were analysed and the result shows that the prevalence had been increased from 22% in 2011 to 47% in 2020

Table 3 shows the pooled prevalence for the risk of physical inactivity and test for bias and heterogeneity

Study ID	Sample Size	Proportion(Prevalence %)	95% CL	Weight(%)
				Random effects
Anandh Vardhan et al., 2011	150	22.00	15.654 – 29.485	8.28
Pranita Ashok et al., 2011	261	90.421	86.185 – 93.705	8.41
S.S.Karikatti et al.,2011	76	67.105	55.374 – 77.457	8.00
Tarun Bhatia et al.,2014	222	45.045	38.380 – 51.844	8.38
Darshan Arathi et al.,2015	200	51.500	44.346 – 58.608	8.36
Prasanth Kumar Battacharya et al., 2016	646	46.285	42.387 – 50.217	8.52
Gopal Krishnan S et al.,2017	251	7.968	4.935 – 12.038	8.41
Murari M Mandal et al.,2017	130	63.077	54.174 – 71.370	8.24
M M Singh et al.,2017	290	55.172	49.248 – 60.990	8.43
Suhash Tetraway et al., 2020	135	82.222	74.713 – 88.264	8.25
Alan Jose Janga et al., 2020	2523	47.087	45.124 – 49.057	8.58
Santhosh Mahajan et al., 2020	102	47.059	37.097 – 57.196	8.14
Total (Random Effects)	4986	51.988	40.88 – 63.775	100
Test for heterogeneity				
Q = 628.8862 DF= 11 Significance level($P<0.0001$) I^2 (inconsistency) = 98.25% 95% CI for I^2				
Publication bias Egger’s test Significance level (P = 0.4100) Begg’s test Significance level (P= 0.5833)				

Fig 3A shows the proportion of prevalence of physical inactivity among participants in each study to assess for bias

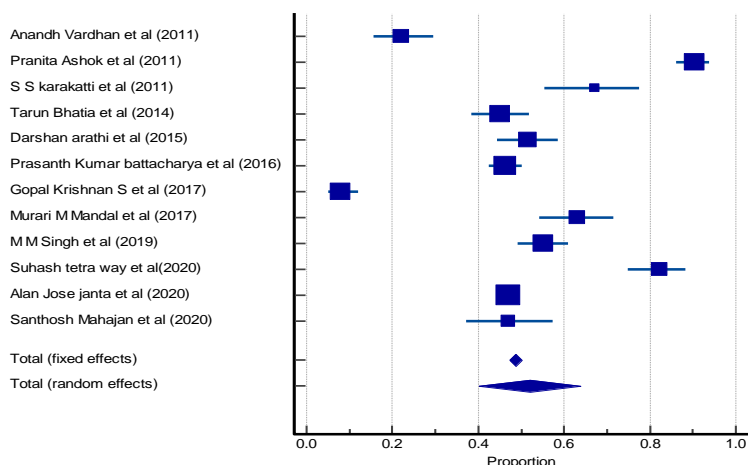
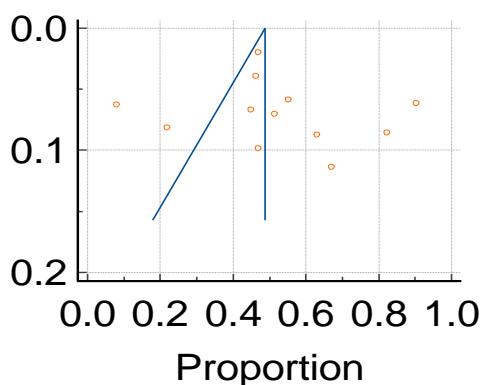


Fig 3B shows the prevalence of risk of physical inactivity among students



Family History

With the data available from the included studies, participants who have either single parent or both parents having diabetes were considered as the risk factor of diabetes and the result were prepared (see table 4) pooled prevalence(fixed effect 5.076 with the confidence interval of 4.484 to 5.721 and with random effect 12.768% with the confidence interval of 7.347 to 19.416, I²= 96.94%). The graphical display on the pooled prevalence is displayed in forest plot (see figure 4A) and the egger's test(p<0.0001),begg's test(P=0.0136) showed publication bias and significance heterogeneity and the funnel plot (see fig 4B) was also provided to assess the symmetry of proportion of included studies with the standard error, figure 6 shows the temporal trend of risk factor of family history and it is noted that the prevalence of family history of diabetes have been increased from 8.44% in 2011 to 15.38% in 2020

Table 4 shows the prevalence of family history of diabetes from the included studies and the risk of bias and heterogeneity were assessed

Study ID	Sample Size	Proportion(Prevalence %)	95% CL	Weight(%)
				Random effects
Anandh Vardhan et al., 2011	150	8.44	4.530 – 14.096	8.28
Pranita Ashok et al., 2011	261	9.395	6.144 – 13.604	8.47
S.S.Karikatti et al.,2011	76	46.745	35.202 – 58.550	7.77
Tarun Bhatia et al.,2014	222	14.609	10.239 – 19.953	8.41
Darshan Arathi et al.,2015	200	13.259	8.879 – 18.748	8.37
Prasanth Kumar Battacharya et al., 2016	646	4.122	2.725 – 5.955	8.66
Gopal Krishnan S et al.,2017	251	18.571	13.958 – 23.943	8.46

Murari M Mandal et al.,2017	130	21.302	14.611 – 29.344	8.16
M M Singh et al.,2017	290	6.302	3.794 – 9.746	8.50
Suhash Tetraway et al., 2020	135	13.169	7.966 – 20.062	8.50
Alan Jose Janga et al., 2020	2523	1.480	1.046 – 2.031	8.18
Santhosh Mahajan et al., 2020	102	15.379	8.998 – 23.867	8.76
Total (Random Effects)	4986	12.768	7.347 – 19.416	100
Test for heterogeneity				
Q = 359.4400 DF= 11 Significance level(P<0.0001 I²(inconsistency) = 96.24% 95% CI for I²= 95.84 – 97.75				
Publication bias				
Egger's test Significance level (P = 0.4100) Begg's test, Kendall's Tau = 0.5455 P=0.0136				

Fig 4A forest plot shows the prevalence of risk of physical inactivity among student

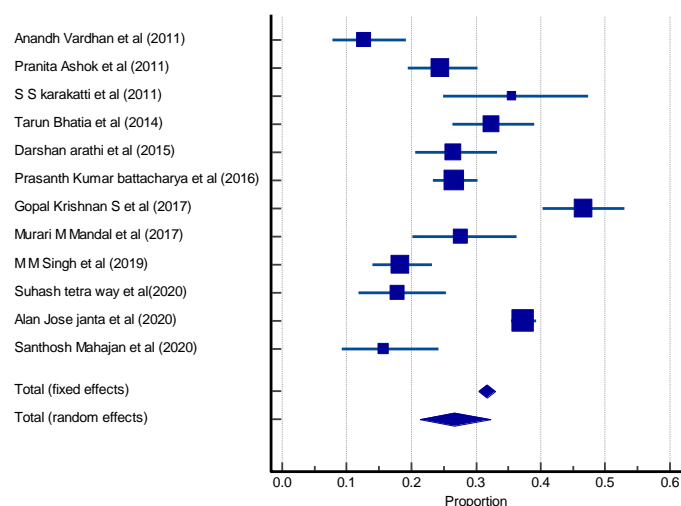
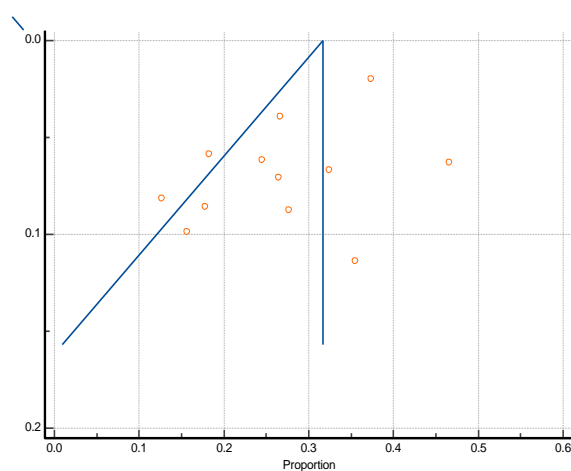


Fig 4B Shows the proportion of prevalence of physical inactivity among participants in each study to assess for bias



Abdominal obesity

Table 5 shows the prevalence of abdominal obesity among the studies included and the risk of bias and heterogeneity were assessed

Study	Sample size	Proportion (%)	95% CI	Weight (%)	
				Fixed	Random
Anandh Vardhan et al (2011)	150	8.667	4.696 to 14.364	3.02	8.21
Pranita Ashok et al (2011)	261	37.931	32.020 to 44.119	5.24	8.51
S S karakatti et al (2011)	76	17.105	9.435 to 27.473	1.54	7.62
Tarun Bhatia et al (2014)	222	31.532	25.478 to 38.086	4.46	8.43
Darshan arathi et al (2015)	200	36.000	29.350 to 43.071	4.02	8.38
Prasanth Kumar battacharya et al (2016)	646	18.266	15.360 to 21.466	12.95	8.76
Gopal Krishnan S et al (2017)	251	62.948	56.649 to 68.937	5.04	8.49
Murari M Mandal et al (2017)	130	48.462	39.610 to 57.385	2.62	8.11
M M Singh et al (2019)	290	25.172	20.281 to 30.579	5.82	8.55
Suhash tetra way et al(2020)	135	17.778	11.735 to 25.287	2.72	8.14
Alan Jose janta et al (2020)	2523	34.007	32.158 to 35.893	50.50	8.89
Santhosh Mahajan et al (2020)	102	41.176	31.523 to 51.356	2.06	7.91
Total (fixed effects)	4986	31.715	30.426 to 33.026	100.00	100.00
Total (random effects)	4986	30.849	23.726 to 38.462	100.00	100.00

Test for heterogeneity

Q	277.3072
DF	11
Significance level	P < 0.0001
I ² (inconsistency)	96.03%
95% CI for I ²	94.46 to 97.16

Publication bias

Egger's test	
Intercept	-0.7126
95% CI	-7.1277 to 5.7025
Significance level	P = 0.8095
Begg's test	
Kendall's Tau	-0.03030
Significance level	P = 0.8909

Among the total of 4986 participants who are having the waist circumference of more than 80cm in females and 90 cm in males were considered as the abdominal obese participants . Our study reported (table 5)the pooled prevalence of abdominal obesity were 30.84% (95% CL 23.726 – 38.462) and the trend of prevalence of abdominal obesity (see figure 6) was observed from 8.61;% in 2011 to 31 % in 2020. Significant publication bias and the heterogeneity were found (I² (inconsistency) = 96.03%, significance level P=0.8095 , P = 0.8095 on egg's test and begg's test).further the graphical representation of the proportion were also showed in figure 5A and the funnel pot in fig 5B in order to assess the bias.

Fig 5A shows the proportion of prevalence of abdominal obesity among participants in each study

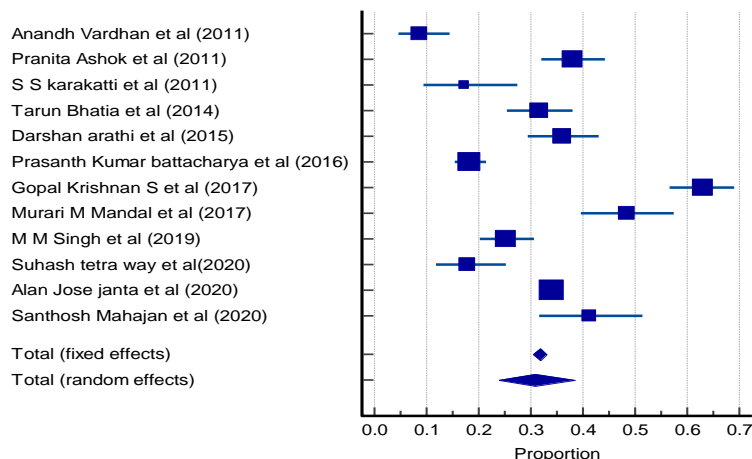


FIG 5B SHOWS THE FUNNEL PLOT WITH PROPORTION OF ABDOMINAL OBESITY AND TO ASSESS THE BIAS

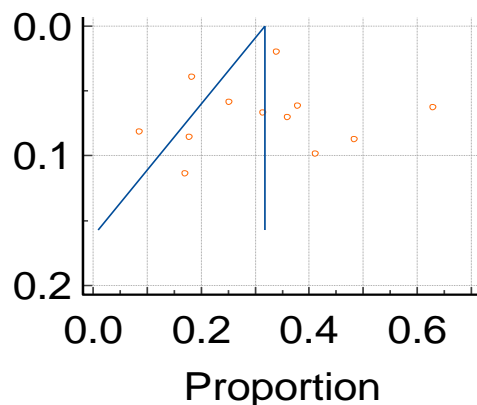
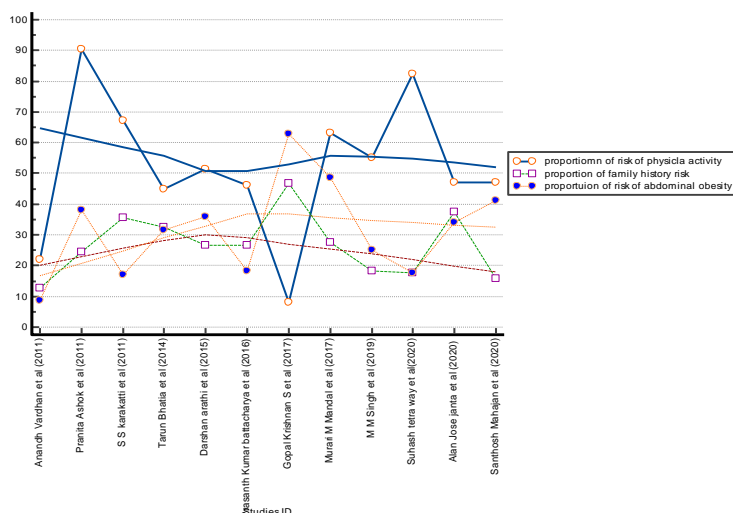


Figure 6 shows the overall prevalence f risk factor of diabetes



V.DISCUSSION

The main purpose of this systematic review was to compile all the available data related to the prevalence of risk of diabetes and its risk factors among the student population of india between 2011 to 2022. The information furnished in this systematic review will help to improve the public health strategy to reduce the risk and burden of this diabetes in the future. Twelve studies based on 4886 participants were included in this study.

Prevalence of risk of diabetes as per IDRS

The results showed that the pooled prevalence of risk of diabetes was 54% . By comparing this result with the pooled prevalence of diabetes in india (42.5) and across various countries was shown to be lower than in Nepal (8.4%)¹⁵ and Pakistan (14.7%)¹⁶ and Cameroon(7.1%)¹⁷ . The pooled prevalence of risk of diabetes were similar to the data estimated by World health organisation about the risk of diabetes which was over 50% in india²⁵.One possible reason may be that due to rapidly changing food habits due to industrialisation and the people energy expenditure have been significantly declined which leads to low physical activity and sedentary life style of younger population of india which increases the risk of diabetes and leads to increase in the prevalence of risk factor of diabetes as shown in our study

Prevalence and trend of risk factors of diabetes as per IDRS

Physical Activity

Of the 4986 participants involved in our study, Our study reported a pooled prevalence of physical inactivity was 48.7% which was similar to the report published by the ICMR-INDIA B study (phase -1)¹⁸ which included a total of 14227 and showed that 54.4% were inactive. It emphasises the need for the increasing awareness regarding the physical activity and our study shows that increasing trend of lack of physical activity for 22 % in 2011 to 47% in 2022 underscores the need to improve overall physical activity underscores the urgent need to improve recreation physical activity among the Indian population to prevent the twin epidemics of diabetes and obesity in india

Abdominal obesity

Our study reported that the pooled prevalence of abdominal obesity among the 4986 participants. In a collaborative study by Indian Council of Medical Research (ICMR) and INDIA B which was published by Rajendra Pradeepa et al ¹⁹, The overall shows that overall prevalence of abdominal obesity among 12,634 participants was 20.4%. In countries like India, the rise in obesity prevalence could be attributed to the increasing urbanization, use of mechanized transport, increasing availability of processed and fast foods, increased television viewing, adoption of less physically active lifestyles and consumption of more “energy-dense, nutrient-poor” diets^{19,20,21}

Family history

The family history of diabetes among the young Indian student population can be directly related with the increasing prevalence of diabetes among the older adults in india. Our study reported a pooled prevalence of family history in one or both the parents having diabetes and it was found to be 12.768%. The family history was independent of the participants however the increase in prevalence of family history of diabetes (see fig 6) from 8% in 2011 to 15% in 2020 shows that it is due to the increase in prevalence of diabetes in older population which has an impact in the family history of the present student population of india . Hence by analysing this trend a valuable insights can be taken to assess the alarming increase of the incidence of diabetes in recent years and preventive strategy can be made for future.

Strength and limitations of the study

This systematic review and meta analysis has its own strength and limitations. We used a comprehensive research strategy to identify studies which met our inclusion criteria and attempted to increase the quality and comparability of the included studies by using well defined eligibility criteria, so that the strict focus of this study will only be on the young adult student population. No publication bias were found in our analysis which illuminates that we did not miss any potential studies that could have changed the findings of this meta analysis. Further more the included articles in this study cover almost every region of india. meta analysis on the prevalence of risk of diabetes among the Indian student population have not been published in any electronic data bases which proves the uniqueness of our meta analysis

Our study has some potential limitations, first due to the limited number of articles available which meet our eligibility conditions. More over no meta analysis on the prevalence of risk of diabetes among the Indian student population have been published in electronic data bases makes our comparison with the results and provide a detailed discussion with similar studies have been made difficult and makes the study vulnerable to heterogeneity and publication bias.

VI. CONCLUSION

This systematic a review and meta analysis shed light on the prevalence of risk factors of diabetes among the student population in india. The findings of our study suggest that the pooled prevalence of risk of diabetes is 51% which is similar to the prevalence of diabetes in the general population²⁵. The trend of increasing physical inactivity and abdominal obesity among the student population indicates an urgent need for public health interventions to prevent risk factors of diabetes in order to prevent the future burden of the disease. Additionally, the increase in the prevalence of family history of diabetes among the student population indirectly shows the impact of the increasing incidence of diabetes in the older populations in india. This study highlight the importance of developing effective preventive strategies to reduce the burden of diabetes in india’s younger population. Further research is needed to explore the reasons behind the high prevalence of diabetic risk factors among student and to assess the effectiveness in preventive measures.

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