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Original Research Article

Prevalence of prediabetes and diabetes in overweight and obese children aged 5 to 15 years and their association with triglycerides, blood pressure, ALT and acanthosis nigricans: a single centre cross-sectional study

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ABSTRACT

Background: The rising prevalence of childhood obesity has led to an increasing burden of metabolic disorders, including prediabetes and diabetes. Early identification of metabolic risk factors in overweight and obese children is crucial for timely intervention and prevention of long-term complications.
Methods: A cross-sectional study was conducted on 141 children, classified as overweight or obese using BMI percentiles. Anthropometric data, blood pressure and presence of acanthosis nigricans were recorded. Laboratory tests included fasting blood sugar, HbA1c, serum triglycerides and ALT. Statistical analysis evaluated prevalence and associations with glycemic status.
Results: Of the children,58.9% were males; 71.6% were obese and 28.4% overweight. Glycaemic distribution was 24.1% non-diabetic, 69.5% prediabetic and 6.4% diabetic. Prediabetes was most common in both overweight (62.5%) and obese (72.3%) groups. Among overweight children, systolic blood pressure (SBP) was significantly associated with glycaemic status (p=0.022); all diabetics had SBP in the 90-95th percentile. In obese children, SBP differences were not significant. Triglyceride abnormalities were significant in obese children (p=0.0001), especially in diabetics (100%) and prediabetics (43.8%), with the highest mean level in diabetics (182.7±33.1 mg/dl; p=0.023). ALT levels showed no significant association in either group (p=0.782 in overweight, p=0.399 in obese). Acanthosis nigricans was significantly more common in obese children (p=0.031), seen in 93.2% of prediabetics and 100% of diabetics.
Conclusions: Prediabetes was highly prevalent (69.5%) among overweight and obese children. Elevated SBP was linked to diabetes in overweight children, while triglyceride abnormalities were prominent in obese diabetics. Acanthosis nigricans emerged as a strong clinical marker of insulin resistance. These findings highlight the need for early detection, targeted lifestyle interventions and public health strategies, with longitudinal studies essential to confirm associations and evaluate interventions.

Keywords: Acanthosis nigricans, Prediabetes, Overweight, Obese, Insulin resistance

INTRODUCTION

Diabetes mellitus is one of the leading chronic diseases of childhood and adolescence, with significant effects on quality of life, families and public health.[1] Although type 1 diabetes remains the most common form in children, type 2 diabetes is rapidly increasing and has emerged as a major global health problem, particularly in developing countries.[2] India currently contributes nearly half of the global diabetes burden, with an estimated 77 million cases in 2019 projected to rise to 134 million by 2045.[3] This epidemic is largely driven by rapid urbanization,

changing dietary patterns, and declining physical activity, as reflected in higher prevalence rates in urban populations.[4] Type 2 diabetes in children is often underdiagnosed as it may remain asymptomatic for years. It is typically preceded by a prodromal phase of impaired glucose regulation, referred to as prediabetes.[5] Prediabetes is defined by the American diabetes association (ADA) as a fasting glucose concentration of 100-125 mg/dl or a HbA1c value between 5.7% and 6.4%, or a two-hour plasma glucose tolerance concentration after 75 gm oral glucose tolerance test of 140-199 mg/dl. The World Health Organization (WHO) has defined prediabetes as fasting plasma glucose of 110 to 125 mg/dl and impaired glucose tolerance defined as 2-hour plasma glucose of 140-200 mg/dl after ingestion of 1.75 g/kg, up to a maximum dose of 75 g.[3-6] With the ongoing childhood obesity epidemic, the prevalence of prediabetes is rising worldwide. Obese children and adolescents are particularly vulnerable to glucose intolerance, type 2 diabetes, insulin resistance and cardiovascular risk, influenced by both genetic and environmental factors.[6]

Most previous studies have predominantly examined children above 10 years of age, with limited evidence available in younger cohorts. Existing literature indicates that the prevalence of obesity-related comorbidities, including hypertension and dyslipidaemia, rises in parallel with increasing severity of obesity in both children and adolescents. Importantly, elevated systolic blood pressure is as clinically relevant as diastolic hypertension in the paediatric population, since systolic elevations are strongly associated with target organ damage and long-term cardiovascular risk.[7] However, data on the prevalence of prediabetes and its associations in Indian children remain scarce. The present study was therefore undertaken to estimate the prevalence of prediabetes, and diabetes in overweight and obese children and to examine its association with acanthosis nigricans, blood pressure, serum alanine aminotransferase (ALT) and serum triglycerides.

This study aimed to determine the prevalence of prediabetes and diabetes among overweight and obese children aged 5-15 years. It aimed to explore whether metabolic (serum triglycerides, ALT levels), cardiovascular (blood pressure) and clinical (acanthosis nigricans) parameters were significantly associated with glycaemic status in this population. The findings from this study will provide insight into the burden and may guide the development of targeted screening and preventive strategies. Such evidence-based approaches are essential for addressing the growing public health challenge of childhood metabolic disorders.

The aim of this study is to assess the prevalence of prediabetes and diabetes among overweight and obese children aged 5-15 years. The objectives of the study are to determine the association of blood pressure, serum triglyceride levels, serum ALT levels and the presence of acanthosis nigricans with prediabetes and diabetes in overweight and obese children.

Inclusion criteria

The inclusion criteria for the study include overweight and obese children aged between 5 and 15 years.

Exclusion criteria

Children with developmental delay, bone deformities and other abnormalities, chronic diseases and type 1 diabetes mellitus were excluded from the study.

METHODS

This observational cross-sectional study was conducted over 18 months (June 2023-November 2024) at Sri Ramachandra Children's and Dental Hospital, Guntur. Overweight and obese children aged 5-15 years, attending outpatient or inpatient services, were enrolled after applying exclusion criteria.

Anthropometric measurements weight, height, and Body mass index (BMI) were noted. Classification of overweight and obesity was done using the Indian Academy of Paediatrics (IAP) 2015 BMI growth charts, which define overweight and obesity as adult-equivalent BMI cut-offs of 23 and 27, respectively.

Clinical examination for acanthosis nigricans and measurement of blood pressure in the supine position were done. Laboratory investigations fasting blood sugar (FBS), glycated haemoglobin (HbA1c), serum triglycerides and alanine transaminase (ALT) were done. Participants were categorized as pre diabetic/ diabetic/and non-diabetic for further analysis of clinical and biochemical parameters.

Statistical analysis

Based on the study by Khalid Al-Rubeaan et al, which reported a 6.12% prevalence of prediabetes, the minimum required sample size was calculated as 138 using the formula: $N \geq (p(1-p))/(ME/z\ \alpha)^2$, where p=prevalence, ME=margin of error (4%) and $Z\alpha=1.96$ at 5% significance. The calculated size (137.95) was rounded to 138; to reduce error, 140 participants were enrolled.

Categorical variables were expressed as frequency and percentage and continuous variables as mean±SD or median. Normality was assessed using the Kolmogorov-Smirnov test.

For comparisons, the unpaired t-test or Mann-Whitney test was used for quantitative variables, while Chi-square or Fisher's exact test was applied for qualitative variables. A p value <0.05 was considered statistically significant. Data were entered in Microsoft Excel and analysed using SPSS version 25.0.

Ethical consideration

Hospital ethics committee and approval was obtained. No is SRCANDDH/DNB/3/2023.

RESULTS

A total of 141 children aged 5-15 years were included; of which 58.87% were males. 101 children (71.63%) were obese and 40 (28.37%) were overweight. Most participants (69.50%) had a positive family history of diabetes and hypertension.

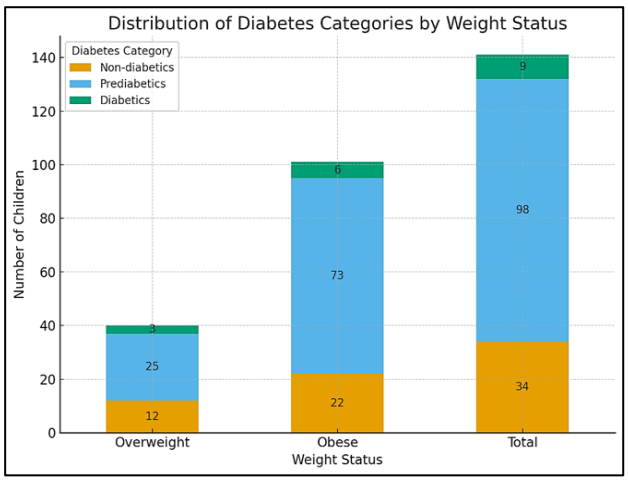


Figure 1: Diabetes categories in overweight and obese children.

Among overweight children (n=40), 30.0% were non-diabetic, 62.5% were prediabetic, and 7.5% were diabetic. In the obese group (n=101), 21.8% were non-diabetic, 72.3% were prediabetic and 5.9% were diabetic. Overall, in the study population (n=141), 24.1% were non-diabetic, 69.5% were prediabetic, and 6.4% were diabetic. Prediabetes emerged as the most prevalent category in both overweight and obese children, with a higher proportion observed in the obese group (Figure 1). In overweight children, systolic blood pressure (SBP) distribution showed a statistically significant difference across glycaemic groups (p=0.022), with all diabetics clustering 100% in the 90-95th percentile and having the highest mean SBP (126.67±7.02 mm Hg). In contrast, non-diabetics and prediabetics were more frequently in the <50th percentile (50% and 40%, respectively), while prediabetics also demonstrated relatively higher proportions in the mid (50–89th) and upper (>95th) percentiles, indicating a gradual upward shift with worsening glycaemic status. Among obese children, however, SBP distribution and mean values were comparable across glycaemic groups (p=0.517), suggesting that obesity itself may overshadow glycaemic influence on SBP. Diastolic blood pressure (DBP), distributions were broadly similar in both overweight (p=0.488) and obese (p=0.303) groups, with no significant differences in mean values, although overweight diabetics tended to cluster in the 50–89th and 90–95th percentiles. Interestingly, obese diabetics were more often found in the lower DBP percentiles, while non-diabetics and prediabetics showed greater proportions in the upper percentiles. Taken together, these findings indicate that elevated SBP is strongly linked with diabetes in overweight children but not in obese children, whereas DBP does not demonstrate a significant association with glycaemic status, despite subtle upward trends among diabetic participants (Table 1). In overweight children, serum triglyceride distribution did not differ significantly among non-diabetics, prediabetics, and diabetics (p=0.858), with normal levels in 83.33%, 76% and 66.67%, respectively, and mean±SD values of 114.67±31.66, 135.8±45.11 and 144±64.16 mg/dl (p=0.326). In contrast, obese children showed highly statistically significant differences (p=0.0001), with normal triglycerides in 86.36% of non-diabetics, 56.16% of prediabetics and 0% of diabetics, while deranged levels were present in 13.64%, 43.84% and 100%, respectively. Mean±SD values were significantly higher in obese diabetics (182.67±33.1 mg/dl) compared to prediabetics (146.21±59.89 mg/dl) and non-diabetics (117.68±42.97 mg/dl) (p=0.023). These findings indicate that triglyceride abnormalities are not prominent in overweight children across glycaemic categories but become significantly pronounced in obese children, particularly diabetics. This highlights the compounded negative impact of obesity and diabetes on lipid metabolism in children (Table 2).

Table 1: Association of systolic and diastolic blood pressures with glycemic categories in overweight and obese children.

Blood pressure	Group	N	<50th percentile	50-89th percentile	90-95th percentile	>95th percentile	P value
Systolic BP in over weight	Non-diabetics	12	6 (50)	2 (16.67)	1 (8.33)	3 (25)	0.022*
	Prediabetics	25	10 (40)	8 (32)	1 (4)	6 (24)	
	Diabetics	3	0 (0)	0 (0)	3 (100)	0 (0)	
	Total	40	16 (40)	10 (25)	5 (12.50)	9 (22.50)	
Systolic BP in obese	Non-diabetics	22	5 (22.73)	8 (36.36)	3 (13.64)	6 (27.27)	0.517*
	Prediabetics	73	14 (19.18)	21 (28.77)	13 (17.81)	25 (34.25)	
	Diabetics	6	3 (50)	2 (33.33)	1 (16.67)	0 (0)	
	Total	101	22 (21.78)	31 (30.69)	17 (16.83)	31 (30.69)	
Diastolic BP	Non-diabetics	12	4 (33.33)	4 (33.33)	3 (25)	1 (8.33)	0.488*

Continued.

Blood pressure	Group	N	<50th percentile	50-89th percentile	90-95th percentile	>95th percentile	P value
in over weight	Prediabetics	25	11 (44)	5 (20)	4 (16)	5 (20)	
	Diabetics	3	0 (0)	2 (66.67)	1 (33.33)	0 (0)	
	Total	40	15 (37.50)	11 (27.50)	8 (20)	6 (15)	
Diastolic BP in obese	Non-diabetics	22	2 (9.09)	9 (40.91)	4 (18.18)	7 (31.82)	0.303*
	Prediabetics	73	12 (16.44)	21 (28.77)	15 (20.55)	25 (34.25)	
	Diabetics	6	3 (50)	2 (33.33)	1 (16.67)	0 (0)	
	Total	101	17 (16.83)	32 (31.68)	20 (19.80)	32 (31.68)	

*Fisher's exact test

Table 2: Association of serum triglycerides with glycemic categories in over weight and obese.

Parameters	Category	Non-diabetic N (%)	Prediabetic N (%)	Diabetic N (%)	Total N (%)	P value
Overweight (n=40)	Normal	10 (83.33)	19 (76)	2 (66.67)	31 (77.50)	0.858*
	Deranged	2 (16.67)	6 (24)	1 (33.33)	9 (22.50)	
	Mean±SD	114.67±31.66	135.8±45.11	144± 64.16	130.07±43.07	0.326§
	Median (25th-75th percentile)	110 (100.75-127.25)	124 (102-142)	130 (109-172)	123.5 (102-139.75)	
	Range	55-181	85-260	88-214	55-260	
Obese (n=101)	Normal	19 (86.36)	41 (56.16)	0 (0)	60 (59.41)	0.0001*
	Deranged	3 (13.64)	32 (43.84)	6 (100)	41 (40.59)	
	Mean±SD	117.68±42.97	146.21±59.89	182.67±33.1	142.16±57.16	0.023§
	Median (25th-75th percentile)	107 (94-123.25)	134 (104-162)	173 (158.5-210.75)	124 (102-162)	
	Range	69-237	72-420	149-224	69-420	

*Fisher's exact test, ANOVA, §

Table 3: Association of serum ALT with glycemic categories in over weight and obese.

Parameters	Category	Non-diabetic N (%)	Prediabetic N (%)	Diabetic N (%)	Total N (%)	P value
Overweight (n=40)	Normal	11 (91.67)	20 (80)	3 (100)	34 (85)	0.782*
	Deranged	1 (8.33)	5 (20)	0 (0)	6 (15)	
	Mean±SD	43.17±37.37	42.12±25.35	22.33±1.53	40.95±28.61	0.512§
	Median (25th-75th percentile)	35 (22.5-43)	36 (26-47)	22 (21.5-23)	32.5 (23.75-43)	
	Range	21-157	20-129	21-24	20-157	
Obese (n=101)	Normal	20 (90.91)	57 (78.08)	5 (83.33)	82 (81.19)	0.399*
	Deranged	2 (9.9)	16 (21.92)	1 (16.67)	19 (18.81)	
	Mean±SD	37.18±12.53	44.23±31	34.33±25.01	42.11±27.72	0.455§
	Median (25th-75th percentile)	37 (26.5-45.5)	36 (24-52)	23.5 (21-32.75)	36 (24-48)	
	Range	19-60	12-201	19-84	12-201	

* Fisher's exact test, ANOVA, §

Table 4: Association of acanthosis nigricans with glycemic categories in obese.

Group	Acanthosis nigricans	Non-diabetic N (%)	Prediabetic N (%)	Diabetic N (%)	Total N (%)	P value
Overweight	Absent	3 (25)	4 (16)	0 (0)	7 (17.50)	0.812*

Continued.

Group	Acanthosis nigricans	Non-diabetic N (%)	Prediabetic N (%)	Diabetic N (%)	Total N (%)	P value
(n=40)						
	Present	9 (75)	21 (84)	3 (100)	33 (82.50)	
	Total	12 (100)	25 (100)	3 (100)	40 (100)	
Obese (n=101)	Absent	6 (27.27)	5 (6.85)	0 (0)	11 (10.89)	0.031*
	Present	16 (72.73)	68 (93.15)	6 (100)	90 (89.11)	
	Total	22 (100)	73 (100)	6 (100)	101 (100)	

*Fisher's exact test

In overweight children, serum ALT distribution was comparable across non-diabetics, prediabetics, and diabetics (p=0.782), with normal levels in 91.67%, 80%, and 100%, respectively. Similarly, in obese children, no significant difference was observed (p=0.399), with, deranged ALT was present in 9.09%, 21.92%, and 16.67%, respectively. These findings suggest that, unlike serum triglycerides, ALT abnormalities were not significantly influenced by glycemic status in either overweight or obese children. This indicates that obesity and diabetes may not independently contribute to liver enzyme derangements in this cohort, although subclinical hepatic involvement cannot be excluded (Table 3).

In overweight children, the distribution of acanthosis nigricans was comparable among non-diabetics, prediabetics, and diabetics (p=0.812), being present in 75%, 84%, and 100%, respectively. In contrast, obese children showed statistically significant differences (p=0.031), with acanthosis nigricans observed in 72.73% of non-diabetics, 93.15% of prediabetics, and 100% of diabetics. Absence of acanthosis nigricans was higher in non-diabetics (25% in overweight and 27.27% in obese) compared to prediabetics (16% and 6.85%) and diabetics (0% in both groups). These findings suggest that while acanthosis nigricans is common even in overweight children irrespective of glycemic status, its prevalence increases significantly in obese prediabetic and diabetic children. This underscores its value as a simple, visible clinical marker of insulin resistance and metabolic risk in pediatric obesity (Table 4).

DISCUSSION

A total of 141 children were included in our study. The mean age of study subjects was 9.85±2.5 years, with a median (25th-75th percentile) of 10 (8-12) years. Males comprised 58.87% (83 cases), while females accounted for 41.13% (58 cases). In comparison, the study by Pedicelli et al included a total of 3110 participants, with 1027 children and 2083 adolescents. The gender distribution in their study was more balanced, with males comprising 51% (1596 cases) and females 49% (1514 cases).[8]

In our study, 101 cases (71.63%) were classified as obese, while 40 cases (28.37%) were overweight. In our study, 98 cases (69.50%) had a positive family history of diabetes or hypertension, while 43 cases (30.50%) had no such history. In the study by Das Rashmi Ranjan et al, a family history of cardiovascular disease, diabetes, obesity, or hypertension was reported in 42.7% of participants.[9]

Pedicelli et al, reported the prevalence of prediabetes increased progressively with obesity severity, and highest risk in adolescents with obesity classes II–III, while our study similarly found a greater prevalence in obese individuals compared to those who were overweight.[8]

Amitha Rao Aroor et al, (India) study showed the overall prevalence of prediabetes was 20.4%, based on a combination of OGTT, FBS, and HbA1c tests.[10] Madhuri Taranikanti et al, investigated prediabetes in rural South Indian adolescent school students aged 14-18 years. The prevalence of prediabetes was 6.8% based on FBS, significantly lower than in the present study.[11] D. Narayanappa et al, studied children aged 5–10 years and reported an even lower prevalence of 3.8% by FBS, highlighting an age-related variation in dysglycemia.[12]

Regarding blood pressure, Pedicelli et al, noted an increase in systolic and diastolic values depending on the prediabetes phenotype, with DBP increasing significantly in IFG and h-HbA1c cases.[8] In our study, systolic blood pressure demonstrated a clear association with glycemic status in overweight children, with diabetics exhibiting significantly higher values compared to prediabetics and non-diabetics. This pattern was not observed in obese children, where systolic blood pressure did not differ significantly across groups, suggesting that the effect of glycemic status on blood pressure may be more evident at lower levels of adiposity but masked in the presence of obesity. In contrast, diastolic blood pressure distributions were broadly comparable among non-diabetics, prediabetics and diabetics in both overweight and obese groups, and mean differences did not reach statistical significance. These findings highlight that systolic rather than diastolic blood pressure appears more sensitive to glycemic status, particularly in overweight children.

Serum triglyceride levels in study by Pedicelli et al, were found to increase with all forms of prediabetes, with a notable rise up to 66 mg/dl.[8] Our findings showed a similar trend, with the highest triglyceride levels observed in obese diabetics, although these differences were not statistically significant. However, among

overweight individuals, triglyceride levels differed significantly across glycemic categories, with all diabetics showing deranged levels.

Regarding serum ALT, Pedicelli et al, reported elevated levels in IFG and IGT cases, particularly when combined with h-HbA1c.[8] In contrast, our study found no significant differences in ALT levels among obese or overweight individuals, although a higher proportion of overweight prediabetics and diabetics had deranged ALT compared to non-diabetics. This finding may indicate early hepatic involvement in dysglycemia, driven by insulin resistance and ectopic fat deposition in the liver, which are more pronounced in individuals with impaired glucose metabolism.

In obese children, however, the uniformly high burden of adiposity may mask these differences, making ALT more useful as an early marker of metabolic dysfunction in overweight children at risk of diabetes.

Regarding acanthosis nigricans, our findings suggest a higher prevalence of AN and prediabetes compared to the Das Rashmi Ranjan et al, study, reinforcing the link between metabolic risk factors and AN. While their study emphasized the association of AN with increased adiposity, our data further highlight its strong correlation with prediabetes and diabetes.[9] in line with our study Thiagarajan et al, examined children aged 5-15 years with BMI >23 kg/m², categorizing them as obese or overweight, and further stratifying them based on acanthosis nigricans (AN) severity. They found that children with significant AN (Grades 2-4) had a significantly higher BMI (p=0.0001), systolic blood pressure (p=0.014), waist circumference (p=0.003), triglycerides (p=0.02), and very low-density lipoprotein (VLDL) levels (p=0.014). Logistic regression confirmed a significant association between high BMI and AN severity (p=0.05; AOR: 1.248).[13]

Limitations

This single-centre study may limit the generalizability of the findings to wider pediatric populations with varying genetic, environmental and socioeconomic backgrounds. The cross-sectional design identifies associations but cannot establish causal relationships between obesity, metabolic parameters, and disease outcomes. Dietary intake, physical activity levels, and sedentary behaviours were not assessed, which limits the ability to fully evaluate lifestyle-related risk factors.

Strengths of the study

The study focuses on children and adolescents with overweight and obesity, a population already at high risk for metabolic complications. Using percentile-based classifications for blood pressure and anthropometric data improves the accuracy of diagnosing hypertension in accordance with pediatric-specific guidelines. The study highlights the growing public health challenge of childhood obesity and metabolic disorders, emphasizing the need for early intervention and policy-level action.

CONCLUSION

In this cohort of 141 children, prediabetes was the most common category (69.5%), observed in both overweight (62.5%) and obese (72.3%) groups. Elevated systolic blood pressure was significantly associated with diabetes in overweight children, while triglyceride abnormalities were markedly higher in obese diabetics, reflecting the compounded metabolic burden of obesity with dysglycemia. Acanthosis nigricans, present in 93.1% of obese prediabetics and 100% of obese diabetics, emerged as a valuable clinical marker of insulin resistance and metabolic risk. These findings underscore the critical importance of early identification, targeted lifestyle interventions, and structured strategies to halt or reverse disease progression, reduce long-term cardiometabolic complications, and inform public health policies aimed at curbing the pediatric obesity epidemic. Future longitudinal studies are needed to confirm these associations and to evaluate the effectiveness of early interventions in altering disease trajectories.

Recommendations

Future studies should adopt a multicentre, population-based design to improve the generalizability of findings across diverse pediatric populations. Longitudinal follow-up is essential to track the progression of metabolic abnormalities and evaluate the impact of early interventions on long-term outcomes. Incorporating detailed assessments of diet, physical activity, and sedentary behaviour will help clarify modifiable lifestyle risk factors.

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REFERENCES

1. Allen PJ, Vessey JA. Primary care of the child with a chronic condition. 4th ed. St Louis, MO: Mosby; 2004.
2. Jones KL. World diabetes day 2008: Focussing on the children. Indian J Med Res. 2008;128:567-9.
3. Aroor AR, Varghese TC, Soans ST. Int J Contemp Pediatr. 2019;6(5):1957-63.
4. Venkatnarayan KM, Campagna A, Imperatore G. Type 2 diabetes in children. A problem lurking in India. Indian Pediatr. 2001;38;701-4.
5. Agwu JC. Screening for type 2 diabetes mellitus in children and adolescents. Br J Diabetes Vasc Dis (Indian edition). 2009;3:S4-9.

6. Agwu JC. Screening for type 2 diabetes mellitus in children and adolescents. Br J Diabetes Vasc Dis. 2009;3:S4-9.
7. Skinner AC, Perrin EM, Moss LA, Skelton JA. Cardiometabolic risks and severity of obesity in children and young adults. N Engl J Med. 2015;373(14):1307-17.
8. Pedicelli S, Fintini D, Ravà L, Iughetti A, Chiarelli G, Manco A. Prevalence of prediabetes in children and adolescents by class of obesity. Pediatric Obesity. 2022;17(7):e12900.
9. Das RR, Mangaraj M, Panigrahi SK, Satapathy AK, Mahapatro S, Ray PS. Metabolic syndrome and insulin resistance in schoolchildren from a developing country. Front. Nutr. 2020;7:31.
10. Aroor AR, Varghese TC, Soans ST. Prevalence of prediabetes in children and its association with risk factors. Int J Contemp Pediatr. 2019;6(5):1957-63.
11. Taranikanti M, Panda S, Sukanya M, Swamy PN, Khan MS, Tabassum H, et al. Prediabetes in South Indian rural adolescent school students. Ind J Physiol Pharmacol. 2014;58(1):77-80.
12. Narayanappa D, Rajani HS, Mahendrappa K, Prabhakar AK. Prevalence of prediabetes in school-going children. Indian Pediatr. 2011;48(4):295-9.
13. Thiagarajan S, Arun Babu T, Manivel P. Acanthosis nigricans and metabolic risk factors in obese children. Indian J Pediatr. 2020;87:162.

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