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Research Paper

Birth Order and Body Mass Index as Determinants of Stress among School-Going Adolescents in a Rural Area of Haryana

Seema Choudhary [1*], Keshav Solanki[2], Neelu Saluja[3], Princy Ghosh[4]
Professor & Head, Department of Community Medicine, Maharaja Agrasen Medical College, Agroha (Hisar), Haryana- 125047,
Senior Resident, Department of Community Medicine, Pandit Neki Ram Sharma Government Medical College, Bhiwani Haryana- 127021,
Professor, Department of Community Medicine, Maharaja Agrasen Medical College, Agroha (Hisar), Haryana-125047,
MBBS Student, Jagadguru Sri Shivarathreeshwara Medical College, Mysore, Karnataka-570 015, India

Abstract
Introduction: *Adolescence is a critical period marked by increased vulnerability to stress due to multiple risk factors. Birth order and nutritional status, reflected by body mass index (BMI), may influence stress levels among adolescents.* ***Objectives:****1. To assess the distribution of school-going adolescents according to birth order and body mass index (BMI), 2. To estimate the stress levels among school-going adolescents, and3. To determine the association of birth order and body mass index with stress among school-going adolescents in a rural area of Haryana.* ***Materials and Methods:*** *A school-based cross-sectional study was conducted among 300 adolescents (classes 8th–12th) from ten government senior secondary schools in Block Agroha. Thirty students were selected from each school, with six students from each class, including equal representation of boys and girls selected through simple random sampling. Data were collected using a predesigned and pretested interview schedule, stress was assessed using the Perceived Stress Scale (PSS-10), and nutritional status was computed using the Quetelet's formula.* ***Results:*** *More than half of the participants (54.0%) were underweight. A gradual decline in proportion with increasing birth order was observed. More than two-fifths (44.67%) of the participants had moderate-to-high-level stress. Birth order showed a strong significant association with stress, with ≥ third-born adolescents having higher odds of moderate-to-high stress (OR = 3.08, 95% CI = 1.875-5.057). However, participants with BMI ≥ 18.5 kg/m² had significantly lower odds of experiencing moderate-to-high stress compared to those with BMI < 18.5 kg/m².* ***Conclusion:*** *Birth order and BMI are significant determinants of stress among adolescents. These findings emphasize the role of familial dynamics and nutritional status in influencing adolescent mental health.*
Key Words: *Birth order, Body mass index (BMI), Perceived stress scale, School-going adolescents, Stress levels*

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I. Introduction

Adolescence is a critical developmental stage characterized by rapid physical, psychological, and social changes.[1] During this period, individuals are particularly vulnerable to stress due to academic pressure, social expectations, and physiological transitions.[2] Stress among school-going adolescents has become a growing public health concern, as it can negatively impact their overall well-being in general and mental health in particular.

Several factors influence stress levels in adolescents. One important yet often overlooked factor is birth order. Birth order plays a significant role in shaping personality traits, emotional responses, and coping mechanisms. First-born children are often exposed to higher parental expectations and responsibilities, while later-born children may experience reduced attention and resources, potentially affecting their stress levels differently.[3]

Another important determinant of adolescent health is Body Mass Index (BMI), which reflects nutritional status. Both undernutrition and overnutrition can influence physical and psychological health.

Underweight adolescents may experience fatigue, low self-esteem, and increased vulnerability to stress, whereas overweight and obese individuals may face social stigma and emotional challenges.[4]

Understanding the relationship between birth order, BMI, and stress is essential for identifying at-risk groups and developing targeted interventions. Despite increasing awareness of adolescent mental health, limited studies have explored the combined influence of these factors, particularly among school-going populations.

Therefore, the present study aims to assess the distribution of adolescents according to birth order and BMI and to examine their role as determinants of stress among school-going adolescents.

II. Materials And Methods

The Study Area:

The study was conducted in all 10-government senior secondary schools in Agroha Block, District Hisar, Haryana. Agroha Block, a rural block among the district's ten C.D. blocks, was selected for operational feasibility as Maharaja Agrasen Medical College is located there.

Study Design:

A cross-sectional study.

Inclusion Criteria:

Adolescents in classes VIII–XII who were willing to participate in the study and had parental or guardian consent.

Exclusion Criteria:

Adolescents who declined participation or lacked parental/guardian consent, and those with physical disabilities or major illnesses.

Sample Size Estimation:

Sample size was calculated using a 25% prevalence of high stress[5], 95% confidence level, and 5% absolute error, yielding 288. A total of 300 adolescents were included to account for non-response and ensure adequate representation.

Sampling Technique:

To obtain a sample of 300, thirty students were selected from each school, with six from each class (VIII–XII). Class lists were used to assign consecutive numbers based on their roll numbers, and three boys and three girls per class were selected by simple random sampling.

Study Tools:

The primary tool in this study was a predesigned and pretested semi-structured interview and examination schedule to collect relevant information.Stress levels among adolescents were measured by the Perceived Stress Scale (PSS-10).[6] The PSS-10 includes 10 items rated on a 5-point Likert scale:0 (never), 1 (almost never), 2 (sometimes), 3 (fairly often), and 4 (very often), with four positively worded items(Items 4, 5, 7, and 8) reverse scored. Participants reported the frequency of perceived stress over the past month. Scores were summed across 10 items (range: 0–40), with higher scores indicating greater stress, categorized as low (0–13), moderate (14–26), and high (27–40).

The weight of adolescents was recorded with the help of portable weighing machine. Body weight was measured (to the nearest 0.1 kg) with the subjects standing motionless on the weighing scale and with the weight distributed equally on each leg. The machine was checked for zero error before taking the weight and was checked periodically by using standard known weight.[7]A stadiometer (measuring rod) capable of measuring to accuracy of 0.1 cm was used to assess height of the subjects. The subject was made to stand without footwear with the feet parallel and with heels, buttocks, shoulders and occiput touching the measuring rod, hands hanging by the sides, head positioned so that the top of external auditory meatus was levelled with the inferior margin of the bony orbit. The horizontal bar was put at right angle on the head and the reading was noted.[7]Body Mass Index of each study subject was computed using the Quetelet's formula [i.e. weight (kg)/ Height $(m)^2$].[8]

Data Collection:

Prior permission was obtained from the District Education Officer (DEO), Hisar. Written informed consent was secured from parents/guardians before data collection. The investigator administered the tools in a designated room within the school, explaining the proforma in the local language. Anonymity and confidentiality were maintained throughout.

Data Analysis:

Data were entered in Microsoft Excel and analyzed using SPSS version 24.0. Both descriptive and inferential statistics (frequency, percentage, chi-square, and odds ratio) were applied.

III. Results

The majority of the participants were first-born (35.7%), followed by second-born (30.3%) and third-born (24.3%). Participants who were fourth-born or higher constituted the smallest proportion (9.7%) (Fig. 1). Regarding body mass index, more than half of the participants (54.0%) were classified as underweight, indicating possible nutritional concerns. A substantial proportion (42.0%) had a normal BMI. Only a small percentage were overweight (3.3%), while obesity was observed in a very minimal fraction (0.7%) of the participants (Table 1).

More than two-fifths (44.67%) of the participants had moderate-to-high-level stress (Figure 2). A statistically significant association was observed between birth order and stress levels. Participants with birth order ≥ third had significantly higher odds of experiencing moderate to high stress compared to those with birth order ≤ second (OR = 3.08; 95% CI: 1.875–5.057). Similarly, body mass index (BMI) was significantly associated with stress levels. Participants with BMI ≥ 18.5 kg/m² had lower odds of experiencing moderate-to-high stress compared to those with BMI < 18.5 kg/m². Overall, higher birth order was associated with increased stress levels, whereas normal or higher BMI appeared to have a protective effect against moderate to high stress.

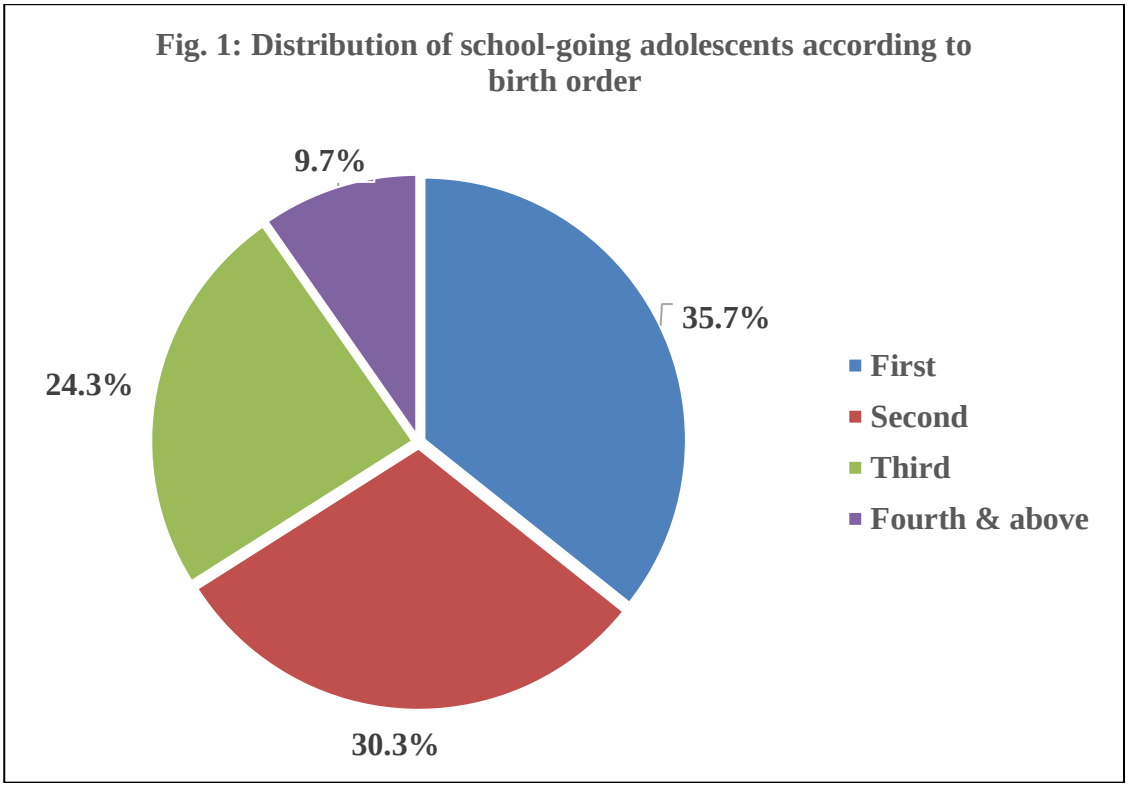

Table 1: Distribution of school-going adolescents according to body mass index (N=300)

Body Mass Index (Kg/m^2)	Number	Percentage
< 18.5 (Underweight)	162	54.0
18.5 - 24.9 (Normal)	126	42.0
25.0 – 29.9 (Overweight)	10	3.3
≥ 30.0 (Obese)	02	0.7
Total	**300**	**100**

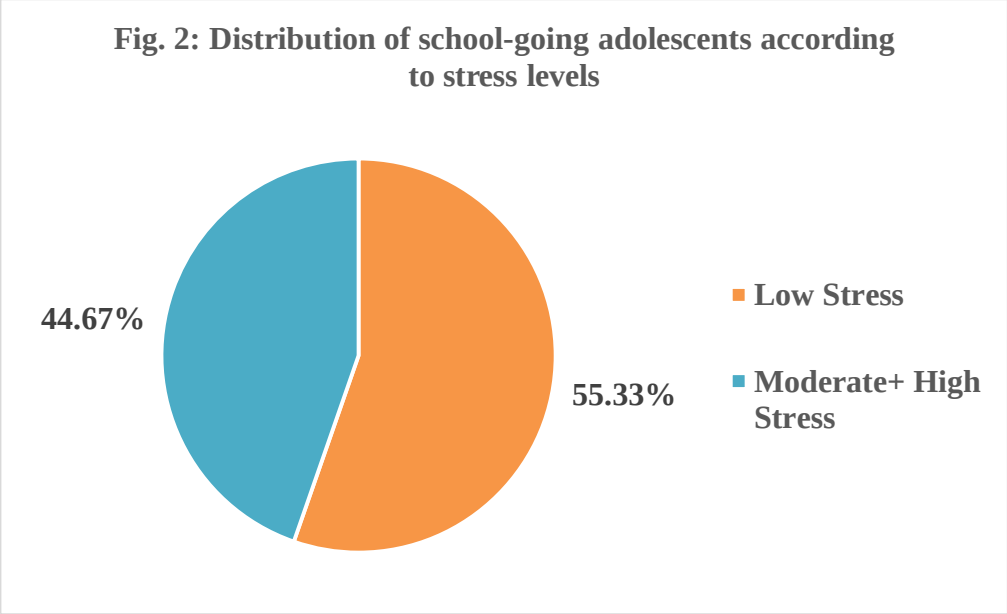

Table 2: Birth order and body mass index as determinants of stress among school-going adolescents

Parameters	N	Stress Levels		χ2	p	Odds Ratio	95% Confidence Interval
		Low Stress N (%)	Moderate+ High Stress N (%)				
Birth order							
≤ Second	198	128 (64.65)	70 (35.35)	20.44 (df=1)	<0.0001	3.08	1.875-5.057
≥ Third	102	38 (37.25)	64 (62.75)				
Body Mass Index (Kg/m^2)							
< 18.5	162	80 (54.9)	82 (45.1)	5.046 (df=1)	0.024	0.5899	0.372-0.936
≥ 18.5	138	86 (62.32)	52 (37.68)				
Total	**300**	**166 (55.33)**	**134 (44.67)**				

IV. Discussion

The findings of the present study are broadly consistent with existing literature on adolescent stress, birth order, and nutritional status, though some variations are observed.

The present study highlights a gradual decline in proportion with increasing birth order, which may reflect smaller family sizes or reduced representation of higher-order births in the study population. With regard to nutritional status, the high proportion of underweight adolescents suggests potential issues related to inadequate nutrition in this rural setting. These findings are consistent with studies from similar rural backgrounds where undernutrition remains a significant concern among adolescents.[9] The low prevalence of overweight and obesity contrasts with trends seen in urban populations, where sedentary lifestyles and unhealthy dietary habits contribute to rising obesity rates.[4] This difference may be attributed to higher physical activity levels and different dietary patterns in rural areas like Agroha.[10] There is a need for targeted nutritional interventions, health education, and regular screening programs in schools to improve adolescent health outcomes.

The proportion of adolescents experiencing moderate to high stress in the present study is comparable to other Indian studies, where stress prevalence ranges widely from 30% to 50%. largely influenced by various factors.[11] The current study found that birth order is significantly a strong determinant of stress, with adolescents of third or higher birth order having three times higher odds of experiencing moderate to high stress compared to first or second-born children (OR = 3.08; 95% CI: 1.875–5.057).This may be attributed to factors such as reduced parental attention, resource dilution, and increased familial responsibilities among later-born children.

While direct evidence linking birth order with stress is limited, related research suggests that family structure and size influence adolescent well-being. Studies have shown that larger family size and resource dilution can negatively affect adolescents' health and psychosocial outcomes.

Studies evaluating the association between body mass index (BMI) and perceived stress have yielded conflicting results. In our study, BMI showed a significant relationship with stress, where underweight adolescents exhibited higher stress levels than those with normal or higher BMI. This finding indicates a possible link between poor nutritional status and increased psychological stress. Our findings are consistent with that reported by Pinto JM et al.[12] but inconsistent with reports of Kaczmarek M et al.[13] and Bharati S et al.[14], who revealed a significant positive association between being overweight/obese and a high level of perceived stress and a negative association between being thin and perceived stress. This indicates that both extremes of nutritional status may be linked with poor mental health.

Overall, the findings of our study highlight birth order and nutritional status (BMI) as important determinants of stress among adolescents. While some studies report differing associations—particularly regarding BMI—the overall trend suggests a complex, bidirectional relationship between physical and mental health in adolescents. These similarities and differences may be attributed to variations in study design, population characteristics, and sociocultural contexts. These results underscore the need for targeted interventions focusing on mental health support for higher birth order children and nutritional improvement among underweight adolescents.

V. Conclusion And Recommendations

The present study demonstrates that both birth order and body mass index are significant determinants of stress among school-going adolescents. Adolescents with higher birth order (≥ third) exhibited significantly greater levels of stress compared to those with lower birth order. Additionally, underweight adolescents were more likely to experience higher stress levels than those with normal or higher BMI. These findings emphasize the role of familial dynamics and nutritional status in influencing adolescent mental health.

In light of these findings, school-based mental health programs should be strengthened for early identification and management of stress. Special attention should be given to adolescents with higher birth order and those who are underweight. Nutritional interventions, regular screening for stress and BMI, and parental awareness programs are recommended to promote a supportive environment and improve overall adolescent well-being.

ETHICAL STATEMENT

The study was approved by the "Institutional Ethics Committee" of Maharaja Agrasen Medical College, Agroha (Hisar), Haryana.

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