

Relation between Nutritional Assessment and Academic Performance of High School Students

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Abstract — The largest and most defenseless segment of our society and the nucleus of every country, children's health and nutritional status serve as a predictor of the future development of that country. Both emerging and developed nations are gravely concerned about children's nutritional issues. Childhood malnutrition can result in growth retardation, physical and mental impairment, and delays in social and emotional development. Many research investigations concerning the subject of academic performance have discovered a significant connection between good eating habits, notably the regular consumption of breakfast, and higher academic achievement, greater school attendance, and better classroom behavior. Today's kids consume a lot of meals that are high in salt, chemicals, and sugar, all of which injure them by, among other things, making them weary, distracted, and ill, which has an impact on their behavior and academic performance. By providing the kid with enough food and sustenance, the parent or guardian should place more emphasis on the child's nutritional state. It is the job of parents and educators to teach children the significance and necessity of appropriate nutrition for them to develop healthy eating habits that will help them throughout their entire lives to attain their full potential.

Aim — To Study Relation between Nutritional Assessment and Academic Performance of High School Students

Design/ Methodology — By evaluating the effect of diet and nutrition on academic performance statistically, information was acquired through the mixed methods case descriptive study using survey data and student performance data. Student questionnaires and student academic records were used to gathering the survey's qualitative data.

Finding — The data we have led to the conclusion that the majority of students had a healthy diet. 60 females and 76 men in the sample (71.20% and 61.20%, respectively) reported eating lunch every day. The sample (or participants) consisted of 22 males (27.50%) and 28 females (22.50%) who ate lunch five days a week. The sample included 7 men (4.40%) and 1 woman (3.60%) who both ate lunch three times each week. 5 (3.30%) men and 1 (2.70%) female in the sample ate lunch twice a week. The remainder of the sample's participants, 0% of whom were male and female, reported not eating lunch at all. As a result, we may conclude that children who routinely eat breakfast and other meals perform better academically.

Keywords: Nutrition Assessment, Eating Habits, Academic Performance, Primary School, Dietary Pattern, Lifestyles, Nutrition

I. INTRODUCTION

Nutrition is a key factor in the development and maintenance of healthy health. Children are the most vulnerable group in

our society and the foundation of every nation, thus their health and nutritional condition are an indicator of how that nation will develop in the future. Nutritional problems in children are a serious concern in both developing and developed countries [1]. Childhood malnutrition may cause physical and mental retardation, reduced growth, and delays in social and emotional development [2]. The body mass index (BMI) is one of the finest measures of dietary status in light of this. Anthropometric measures, such as height and weight, have been recommended by the WHO as a helpful indication of health status [3]. Either nutritional excesses or shortages may affect a person's behavior and cognitive performance. The research found that most children do not eat enough fruits and vegetables, which harms their academic performance when compared to children who do [4].

When a person is of school age, both their physical and cerebral growth is in full swing. To provide the groundwork for long-term health, physical fitness, and intellectual aptitude, it is imperative to ensure optimum nutrition throughout this period [5]. One of the main causes of low school attendance, high absenteeism, poor academic performance, and early dropout, especially during the elementary school years, is malnutrition [6]. According to this study, undernutrition is quite prevalent among rural primary school kids, and there is a significant link between the students' nutritional status and intellectual achievement. These results will help formulate effective strategies to minimize the impact of childhood malnutrition and will serve as a roadmap for the development of future generations [7-8].

Several organizations and governments have agreed that improving children's health and nutrition has a positive influence on their academic achievement, development, and growth. As a result, schools are good settings for implementing interventions like providing students with nutritious meals and teaching them life skills. School-aged children are allegedly exempt from nutrition monitoring [9]. Academic success and healthy nutrition have a close relationship. Researchers have shown that children who eat more fast food generally have worse academic progress, and those who report eating it once a day had slower academic growth in arithmetic, reading, and science than those who don't eat any (Svokes, 2014)[10].

Furthermore, research has shown that well-fed children learn more successfully and that eating a healthy diet is linked to better grades, better attention and memory, and faster information processing. Following a meal that contains foods like eggs, yogurt, apples, and meals that are strong in fiber, protein, and healthy fats, the body feels satiated for longer. These foods also provide the body with the energy it requires to focus and stay awake throughout the day (youth choices, 2021) [11]. According to the CDC and preventive, active students learn better, but a bad diet, inactivity, and an unhealthy lifestyle can all have an impact on children's academic performance.

Revter, Forster, and Brister (2020) investigated the academic performance and identified a substantial relationship between healthy eating habits, particularly virtually daily breakfast intake, higher grades, more frequent attendance at school, and better classroom behavior [12]. According to Chen (2020), many of the meals that children nowadays eat are high in sugar, chemicals, and salt, which is harming the students by making them weary, unfocused, unwell, etc., which negatively affects their behavior and performance [13].

II. LITERATURE REVIEW

In his research, Wanjohi (2010) found that inadequate food and an unbalanced diet were the primary contributors to malnutrition among children in the zone. It was also shown that one of the primary causes of malnutrition in children was poverty. Undernutrition harms children's academic performance as well as their pace of growth and development, according to the study's conclusions about the effects.

Malnutrition is a risky condition that develops when your body does not get enough nutrients to function correctly. An imbalanced diet, insufficient food intake, or the absence of one or more nutrients can all contribute to poor nutrition. [14] Chinyoka and Naidu (2013). Connell's research found that whereas 34% of infants with low birth weight had to retake lessons or be placed in special education classrooms, just 14% of infants with normal birth weight had the same effects [15].

For their children to succeed in school, parents should urge them to eat properly now that they are more aware of the possible effects that dietary deficiencies may have on academic performance, claim Santanu Ghosh and Haradhan Saha. This problem affects such youngsters' academic achievement since they struggle to focus and concentrate in class [16].

Inadequate nutrition or going without food can have detrimental physical, psychological, and social repercussions in addition to lowering academic performance, according to Alaimo (2005) and the Center on Hunger and Poverty (2002) [17]. Despite contradictory findings from research studies, many individuals agree that break dancing programs have increased attendance and decreased tardiness and behavioral problems (Thatcher & Lester, 1985) [18-19]. According to Schoenthaler et al. (2000) [20], the vast majority of studies on behavioral problems and learning difficulties directly attribute these problems' root causes to inadequate food or nutrition. To improve academic performance, they also contend that school-age children need to eat healthier or get more of certain nutrients. Several studies indicate that after-school tutoring programs improve children's basic math scores, illustrating their positive benefits on academic achievement (Schweitzer, 2005 et al.) [21].

III. METHOD

The current study focuses on the degree of bad eating habits and any connections they may have to children's academic performance. It specifically looks into the connection between a student's grade point average and how frequently they eat breakfast, lunch, and/or both during the week. It also

looks into how frequently they miss school over a normal month (GPA).

This chapter evaluates the effect of diet and nutrition on academic performance statistically, information was acquired through this mixed methods case study using survey data and student performance data. Student questionnaires and student academic records were used to gathering the survey's qualitative data.

200 no. of students of the student from Narayan High School, Vadodara took part in this study. Students were given a survey, and information on student achievement was taken from the school's student database.

Gender, age, height, weight, grades, and absenteeism are only a few of the data points gathered. The data was then customized and added to a comprehensive database that was used to calculate a regression model that indicated the statistical effect of meal choice on students' academic advancement.

A. Study Design

The focus of this study is to assess the degree to which unhealthful eating habits exist among students at Narayan High School in Vadodara, India, among the school-age population from classes (11–12). It also seeks to identify any potential links between dietary habits and academic performance.

200 students from higher secondary schools were requested to participate in a survey on their dietary habits (such as eating a balanced meal) and academic achievement for this descriptive survey-based study, which included a convenience sample of non-random participants (e.g. GPA and attendance).

Three areas are covered in this study:

- What kind of eating habits do high school students have?
- How well-nourished are high school kids and how are they performing academically
- What is the connection between students' academic achievement and whether they eat breakfast, lunch, or both?
- This study has limitations despite its endeavor to provide a generic, in line with recent research, response to the research questions.

B. Population Sampling

From Narayan High School, the participants (classes 11–12) were chosen. As a bribe to get students to fill out the questionnaire, the professors gave extra credit points. The number of extra credit points each instructor would award varied. Additionally, during the given two weeks, the teachers choose the day they would distribute the questionnaire.

250 people made up the original population sample. Only 200 people were selected for this study from this sample. Parents' permission forms were provided by instructors, who also collected them. The participants had to present signed parental consent documents because they were under the age of 18. The convenience sample was composed of (n= 110 male) and (n=90 female) school-aged adolescents from courses at Narayan High School (11–12).

This descriptive research was carried out in a learning environment. The social economic standing of the students ranged from working class to middle class.

C. Data Collection and Instrumentation

The questionnaire was completed by the participants.

It included a parent consent form and a debriefing (as mentioned above). A twelve-item questionnaire titled Dietary Practice and Academic Performance was created to investigate the association between poor nutritional practices and low academic performance

The questionnaire included three questions on demographics (ordinal and nominal), seven questions on dietary practice (scale and nominal), one question on current GPA (ordinal), and one question on the number of absences in a typical month of the school year (ordinal).

To conduct this study, the researcher first requested permission from the school principal by explaining its nature and objective. The researcher got in touch with the professors on this campus as soon as authorization for the study was obtained and let them know what it was about and why it was being done. After gaining their consent, the questionnaires were provided to them for distribution in their classrooms. The Parul Institute of Applied Science Review Board gave the survey its approval.

Parents' consent forms were read to students by their teachers. They also let their participants know that taking part in the study would earn them extra credit. Additionally, the teachers told their students that to receive the entire additional credit, the parent permission form needed to be completed, signed, and returned within the next two days. At their discretion, teachers choose to let their students know when the questionnaire will be administered. The parent consent form listed the researcher's name, the survey's duration, and the researcher's contact information in case the parents had any concerns concerning the study or the rights of the research participants.

D. Data Analysis

Quantitative methods were used in the current investigation, including descriptive statistics like frequencies and Chi-Square. The Statistical Package for the Social Sciences was used to analyze the data obtained (SPSS).

The analysis aimed to assess the association between different dietary habits and academic achievement as measured by GPA and absenteeism. The Chi-Square Analysis was used to find a correlation between dietary habits and academic achievement because this study included nominal and ordinal variables.

IV. RESULT

The following headings are used to present the study's findings:

- Characteristics of the participants
- Practices of Nutrition of participants
- Participant's Grade and Absenteeism

A. Sample Findings

200 students from Narayan High School, Vadodara made up the study's demographic sample. A poll on teenager dietary habits and academic performance included high school students from this particular school's 11th and 12th-grade courses. Resident instructors assisted by distributing and gathering parent permission papers from the sample of 200 students of which 110 was male and 90 was female. In January of 2023, the survey was carried out.

B. Characteristics of the participant

The percentage distribution of a few chosen demographic characteristics is shown in Table 1. The information gathered from this demographic sample shows that the age ranges from 16 to 18 years old. What is your age in years? Item 2 responses revealed that the sample was made up of eighteen males of 16-year-olds, twenty-two females of 16 years old, forty-seven males of 17 years old, thirty-eight females of 17 years old, forty-five males, and thirty females of 18 years old.

Answers to question 3, "What is your gender?" reveal that the final sample in this study consisted of 200 high school students, with 110 male and 90 female.

AGE AND GENDER OF PARTICIPANTS		
Age	Male n (%)	female n(%)
16	18(16.36)	22(22.44)
17	47(42.7)	38(42.2)
18	45(16.36)	30(27.27)
Total No	110(55)	90(45)

Table 1: Demographic of participants:

1) Practices of Nutrition of participants

Table 2 Regarding answers to question 6, "How many times a week do you have breakfast, 26 males and 3 females of the participants ate breakfast five days per week, 15 males and 7 female participants ate breakfast three days per week, 6 males and 4 female participants ate breakfast twice per week, and 10 males and 10 females participants said they did not eat breakfast at all. Of the population sample, 53 male and 38 female participants reported eating breakfast every day.

No. Of Days Breakfast Taken By Student Per Week		
No. On Days In A Week Breakfast Eaten By Student	Male n (%)	Female n (%)
7	53(48.18)	38(42.2)
5	26(23.63)	31(34.4)
3	15(13.6)	7(7.7)
2	6(5.45)	4(3.6)
0	10(0.9)	10(9.09)
Total No	110	90

Table 2: No. of Days Breakfast Taken By Student per Week

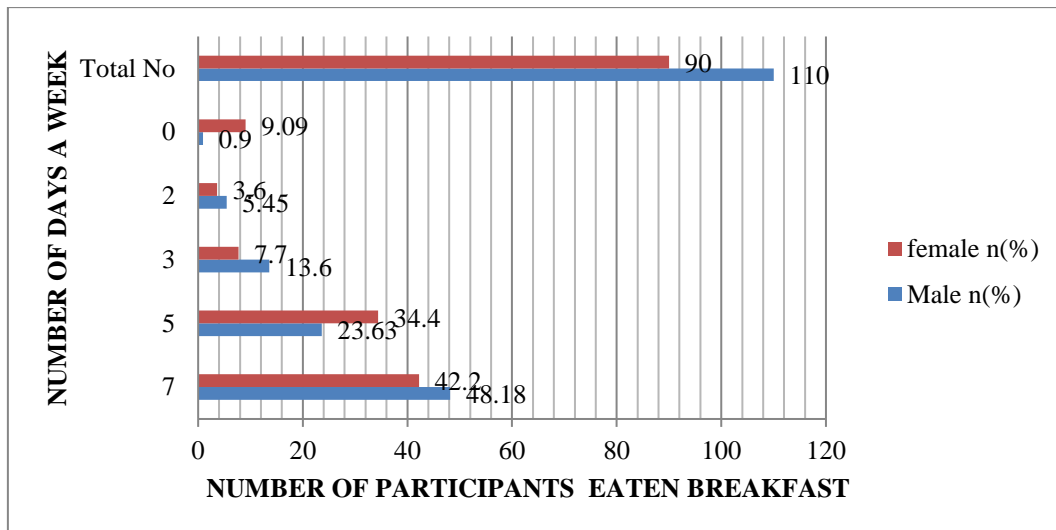


Fig. 1: Consumption of breakfast by participants

Table 3 in answer to question 7, "Do you receive your breakfast through a free school program?"

Of 17 males and 12 females, the participants ate breakfast provided by a free school program, whereas 93 males and 78 females of the participants did not.

GENDER	Yes n (%)	No n (%)	Total No
Male	17(15.45)	93 (84.5)	110
Female	12(13.3)	78(86.6)	90

Table 3 No. of Students Eat Breakfast in School Program
The Consumption of breakfast by participants in the school program is shown in this figure2. The graphs further offer a visual depiction.

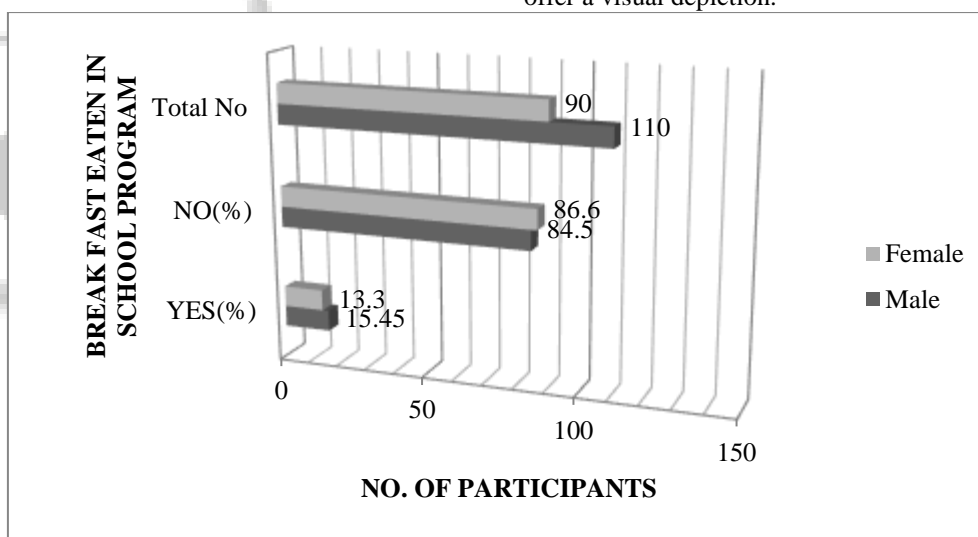


Fig. 2: The Consumption of breakfast by participants in the school program

For answers to question 8, "How often do you have lunch each week?"

7 males and 2 females of participants ate lunch three days per week, 5 males and 0 females of the participants ate lunch two days per week, and 0 of the participants did not eat lunch at all. Of the participants, 22 males and 28 females ate lunch five days per week, and 76 males and 60 females ate lunch seven days per week. Table 4 provides information on replies to item 8 based on its data.

No. Of Days Lunch Eaten By Students In A Week	Male n (%)	Female n (%)
2	5 (4.54)	0
3	7(6.3)	2(1.81)
5	22(20)	28(25.45)
7	76(69.09)	60(66.6)
0	0	0
Total No.	110	90

Table 4: No. Of Days Lunch Eaten By Student Per Week
The Consumption of lunch by participants in a week is shown in this figure4. The graphs further offer a visual depiction.

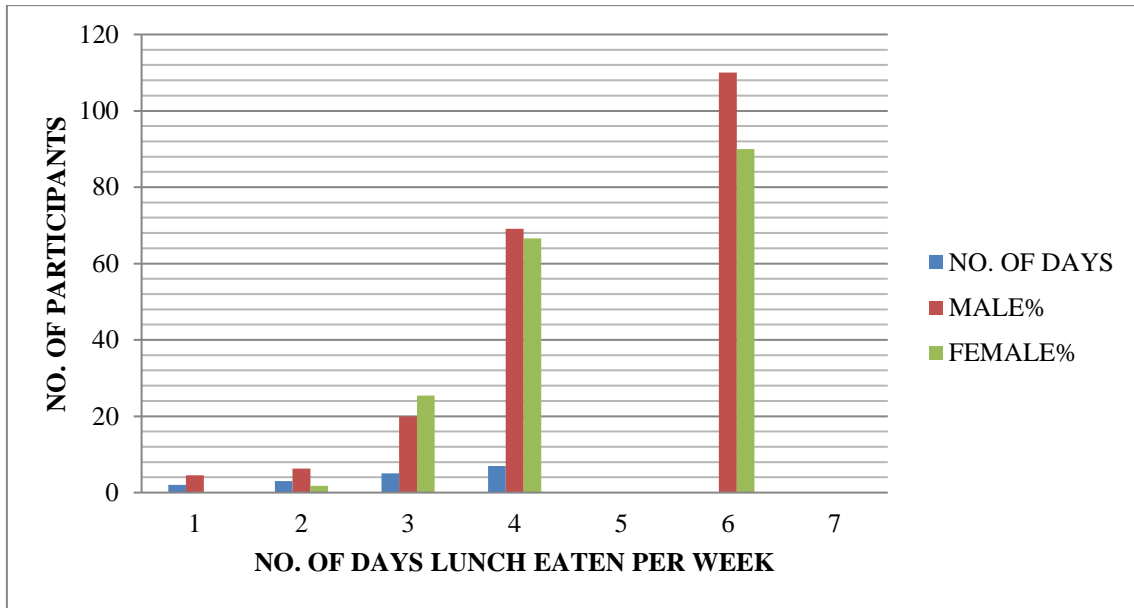


Fig. 3: The Consumption of lunch by participants in a week

Do you typically eat food from a vending machine?
Responses to question 9.

31 male and 62 female participants did not typically purchase food from a vending machine out of all participants, compared to 79 male and 28 female participants who did.

GENDER	No n (%)	Yes n (%)	Total No
Male	31 (28.18)	79(71.81)	110
Female	62(68.88)	28(31.11)	90

Table 5: No. of Students Eating From Vending Machine
Consumption of no. participant through a vending machine is shown in this figure4. The graphs further offer a visual depiction.

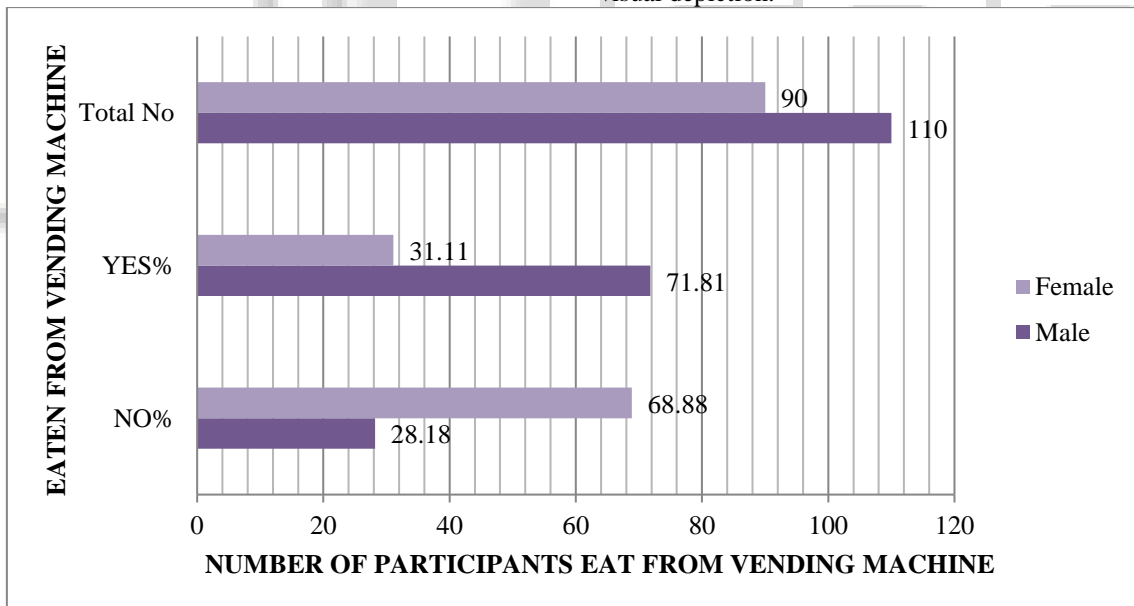


Fig. 4: Consumption of no. Participants through a vending machine

Do you typically take meals from the cafeteria, as indicated by replies to question 10?

69 males and 58 females in the total participants don't eat from the cafeteria and 41 males and 32 females in the sample ate from the school cafeteria.

Gender	No	%	Yes	%	Total No
Male	69	62.72	41	37.27	110
Female	58	64.44	32	35.55	90

Table 6: No. Of Students Eating From the Cafeteria

Do you bring lunch from home to reply to question 11?

92 males and 78 females in the response to an item of the sample brought lunch from home, but 18 males and 12 females of the sample did not, indicating that this group of sample members ate lunch somewhere else.

Gender	Yes N (%)	No N (%)	Total No
Male	92(83.63)	18(16.36)	110
Female	78(86.66)	12(13.33)	90

Table 7: No. Of Students Bring Lunch from Home

No. Participants bring lunch from home as shown in this figure5. The graphs further offer a visual depiction

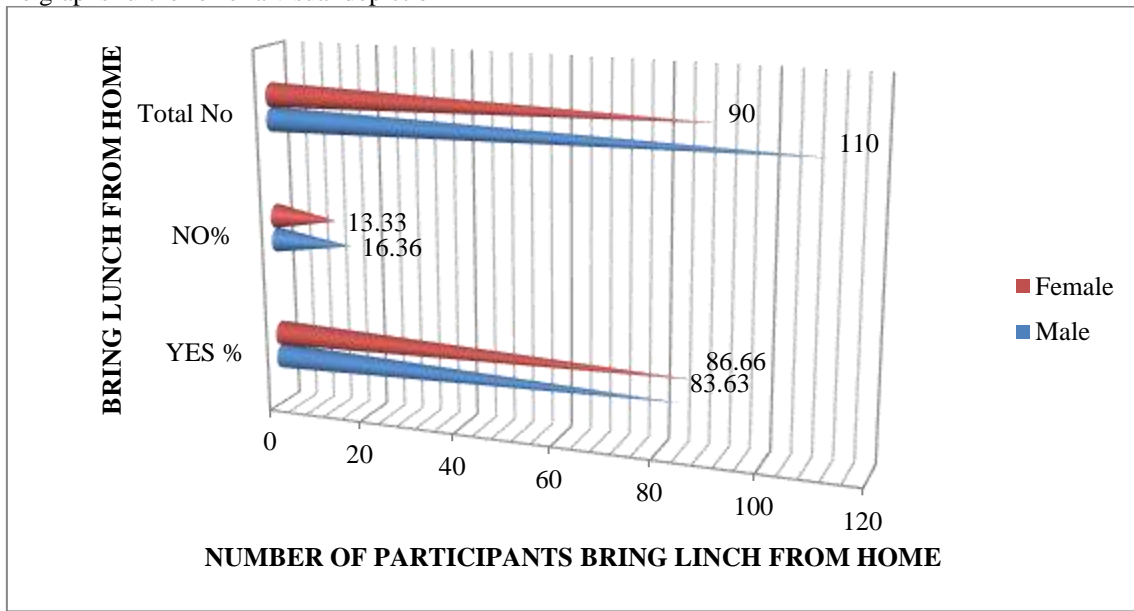


Fig. 5: No. Participants bring lunch from home

C. Participant's Grade and Absenteeism

Table 8 shows how frequently and in what percentage of participants responded to questions about their current GPA and the number of absences they had during a regular school month. Moreover, Table 8 contains responses to items 12 and 13, which asked respondents about their GPA and absence rate. Participants had to check the relevant box for each of these questions.

GPA Grade	Male	%	Female	%
100-90(A+)	19	17.27	15	16.66
89-90(A)	24	21.81	31	34.44
79-70(B+)	32	29.09	21	23.33
69-60(B)	14	12.72	12	13.33
Below 60(C)	20	18.18	11	12.22
Less Than 35=(F)	1	0.9	0	0
Total No.	110		90	

Table 8: Grade Score of Students

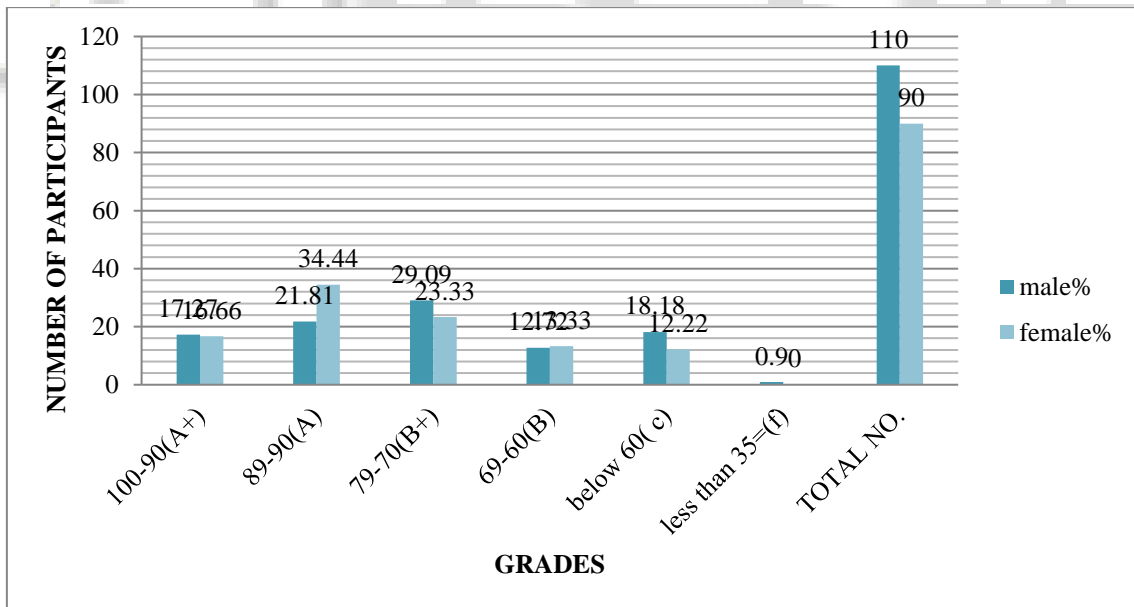


Fig. 6: grade of students

No. Of Days	Male	%	Female	%
0 Days	24	21.81	23	25.55
1-2days	44	40	32	35.55
3-4days	22	20	19	21.11

5-8days	12	10.9	16	17.77
9-12days	8	7.27	0	0
12 Or More Days	0	0	0	0
Total No.	110		90	

Table 9: No. of Days of Absenteeism of Students in a Month

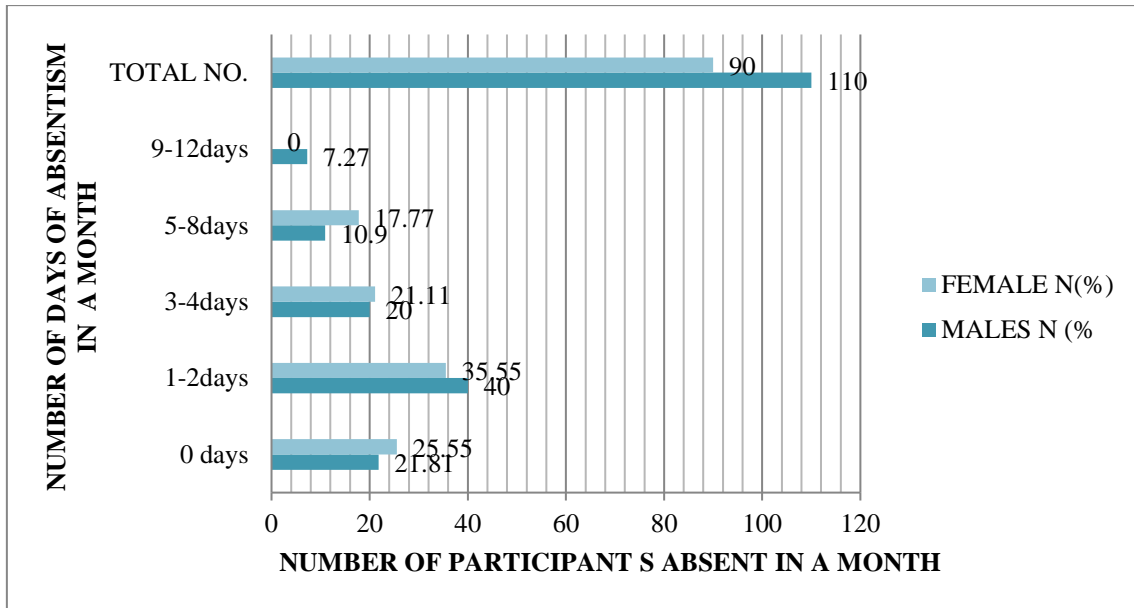


Fig. 7: no. of days of absenteeism of students in a month

D. Results of Chi-Square Tests

To ascertain whether there is a connection between dietary habits and academic achievement, the Chi-Square analysis was used.

The outcomes there was some fascinating information on students' eating habits and grade point averages from the Chi-Square study. According to the Chi-Square analysis, there was no connection between the participant's participation in the breakfast programs at school and their GPA-based academic achievement.

Nonetheless, a substantial correlation between GPA and the consumption of lunch was discovered. According to the findings, eating no. of the day's lunch eaten in a week did appear to be associated with the student's GPA.

Lunch Taken	Male	chi sq	Female	chi sq
Lunch is taken 7 days a week	76	0.02	60	0.02
Lunch is taken 5 days a week	22	1.1	28	1.34
Lunch is taken 3 days a week	7	1.54	1	1.88
Lunch took 2 days a week	5	0.88	1	1.07
Totals	110		90	

Table 10:

The chi-square statistic is 7.8475. The p-value is .049271. The result is significant at $p < .05$.

Grade	Lunch Taken By Students	Chi-Square Value	Lunch Skipped By Students	Chi-Square Value
A+	36	11.121	1	13.511
A	44	10.021	7	10.111
B+	54	1.12	3	3.34
B	19	10.241	5	10.421
C Or F	17	13.571	14	18.211
Total	170		30	

Table 11:

The chi-square statistic is 37.0122. The p-value is .000222. The result is significant at $p < 0.05$.

Here we have considered the Degree of freedom as 3 and correction up to $\alpha=0.05$

So we conclude that students taking regular lunch are better in their academics.

The frequency and percentage for each item and scale identified in the questionnaire were reported.

To find potential correlations between the chosen variables, Chi-Square analyses were performed.

Two factors were shown to significantly influence GPA:

- 1) A strong correlation between GPA and the frequency of lunch consumption among the participants was found.
- 2) A strong correlation between GPA and participants' regularity of lunch consumption was found.

At the 0.05 level, the Pearson Chi-Square Tests were significant (two-sided).

V. DISCUSSION

Considering that nourishment is required to boost energy levels during physical exercise. It demonstrates how eating a healthy, balanced diet keeps the body in good shape and proportion to its size and weight. Malnutrition, though, might make it difficult for someone to function. It's possible that food shortages contributed to metabolic alterations in the brain. [22-24].

Parents have a big impact on the health of their children and how often they use the medical system. Youngsters with less education tend to be in worse health than those with more education [25].

Previous research has shown that well-fed youngsters are frequently better able to make use of educational opportunities, are more enthusiastic to attend school, and are more prepared to learn (Naik et al., 2015) [26]. So, the state of the children's food has a big impact on how well they do in school.

According to previous research, well-nourished kids are frequently better equipped to take advantage of educational opportunities, more motivated to go to school, and more ready to learn (Naik et al., 2015) [26]. So, the state of the children's food has a big impact on how well they do in school. Nutritional status has a detrimental effect on a child's cognitive development (Opoola et al., 2016; Dey and Nath 2017) [27-28]. Because of their low academic performance, undernourished children may not have a bright future (Agarwal et al. 2018) [29]. Reducing undernutrition can contribute to improving kids' cognitive development, which may eventually improve their ability to advance in school. According to Acharya et al. 2019 and Okafor, [30–31] children who eat a nutritious diet are more focused and do better in school.

VI. CONCLUSION

The results of this study confirmed a massive proportion of earlier research on the relationship between eating a healthy diet and academic success. These results imply that youngsters of school age may perform below average as a result of inadequate food intake. On the other hand, it is well-recognized that school-age children who eat a balanced diet tend to perform better academically. Many parents are not aware of the advantages of providing a balanced lunch for their kids each day. To educate these parents on the benefits of having a well-balanced diet every day and the risks of skipping meals for their kids, health educators, and classroom instructors are required [32]. These results, while neither causative nor definitive, would seem to suggest that, if schools are concerned about student academic performance and income streams, attention should be made to students' dietary quality, dietary habits, and training. This study also found a statistically significant positive link between GPA and how frequently people consume a healthy diet and if they bring lunch. These results are consistent with prior studies by Levinger (1996), who claimed that hunger is an issue that is becoming worse and that it may hinder learning in school-age children. A substantial correlation between GPA and the number of absences kids take each month over a school year was further demonstrated by this study's findings. According to the absenteeism correlations found in this study, students' GPAs drop the more school days they skip over a typical month [33].

It is important to understand that poor nutrition is a definite, observable factor that has a detrimental effect on academic performance, as demonstrated by the literature and the results of this study. Thankfully, research indicates that treating poor nutrition is the most straightforward strategy to aid pupils in developing their cognitive talents, regardless how detrimental it may be (Bryan et al., 2004) [34]. Further studies are necessary to better understand the relationship between poor eating habits and academic performance as well as to monitor the development of school-based nutritional

education initiatives. Replicating this study and adding more details about the students' living situations and the level of parental participation and support would be beneficial.

REFERENCES

- [1] Chambers R. Back matter-challenging the professions. *Challenging the professions: frontiers for rural development*. Rugby: Practical Action Publishing; 1993. p. 122–43. 2.
- [2] Sohi Darshan, *Elements of nutrition*, 2014 edition, An impediment of S. VIKAS & COMPANY (Medical publishers) INDIA, 2014, Pp- 4 3.
- [3] World Health Organization (WHO). *Population-based approaches to childhood obesity prevention*. 2012.
- [4] Lahey M, Rosen S. *Dietary factors affection learning behavior*, 2010. Retrieved from URL: <http://childrensdisabilities.info>.
- [5] Chandramohan S, Javed Khan J and Raj RJ (2015). *Nutritional Status Assessment of Primary school children in Udupi District Karnataka: A Cross Sectional Study*. *International Journal of Applied Research and Studies*. Vol 4 No 3 pp 1-6
- [6] Subhprada SC (2015). *Nutritional Status of Government Primary School Children in an Urban Slum, Kurnool, Andhra Pradesh*. *International Journal of Current Medical and Applied Sciences*. Vol 6 No 3 pp 167-170.
- [7] Khan M, Shanawaz M, Altoaibi AA, Gaba AAB, Saqeeh OI and Mashali ARA (2020). *Assessment of nutritional status and its effect on academic performance in school children of Jazan, Kingdom of Saudi Arabia*. *International Journal of Community Medicine and Public Health*. Vol 7 No 4 pp 1234-1239
- [8] Agarwal A, Jain S, Garg SK, Chopra H and Bano T (2018). *Prevalence of malnutrition and its impact on scholastic performance among 8–12-year children from 2 schools of urban Meerut*. *Journal of Medical and Allied Sciences*. Vol 8 No 1 pp 1-6.
- [9] Best C, Neufingerl N, van Geel L, van den Briel T, Osendarp S. (2010) *The nutritional status of schoolaged children: why should we care?* *Food Nutr Bull*. 31(3):400-17. Review. PubMed PMID: 20973461.
- [10] Svokosa, (2014). *Children who eat more fast food show less Academic improvement*. <https://m.huffpost.com>
- [11] *The Youth clinic* (<https://youthclink.com>)
- [12] Revter PR, Forster Bit & Sierra, R. & Brister, B.S. (2020). *The influence of eating habits on the academic performance of University students*. *Journal of American College Health*. ISSN: 0744- 8481 (Print) 1940-3208 (online) journal homepage: (<https://www.tandfonline.com/loi/vachzo>)
- [13] Chen, G. (2020). *How Diet and Nutrition Impact a child's Learning Ability*. *Public School Review.Com* 244 5th Avenue, N J- 229 New York, NY 10001.
- [14] Chinyoka and Naidu (2013) *Impact of Poor Nutrition on the Academic Performance of Grade Seven Learners: A Case of Zimbabwe*, retrieved from <https://pdfs.semanticscholar.org> on August 17, 2017

- [15] Conell (2010:127). Nutrition and Student's Academic Performance, retrieved from <https://www.wilder.org> on September 10, 2017
- [16] Ecker and Nene (2012) Impact of Poor Nutrition on the Academic Performance of Grade Seven Learners: A Case of Zimbabwe, retrieved from <https://www.researchgate.net/publication> on August 17, 2017
- [17] DepEd Order no. 43 s. 2011, Strengthening the School Health and Nutrition Programs for the Achievement of the Education for All (EFA) and Millennium Development Goals (MDGs), retrieved from <http://www.deped.gov.ph> on August 05, 2017
- [18] Alaimo, K. (2005). Food Insecurity in the United States: An Overview. *Topics In Clinical Nutrition*, 20(4)
- [19] Thatcher, R., & Lester, M. (1985). Nutrition, Environmental Toxins, and Computerized EEG: A Mini-Max Approach to Learning Disabilities. *Journal of Learning Disabilities*,
- [20] Schoenthaler, S., Bier, I., Young, K., Nichols, D., & Jansens, S. (2000). The Effect Of Vitamin-Mineral Supplementation On Intelligence Of American Schoolchildren: A Randomized, Double-Blind Placebo-Control Trial. *The Journal of Alternative and Complementary Medicine*. 6(1),
- [21] Schweitzer, D. (2005). Teachers Provide Good Medicine In The Classroom. *Child Nutrition American School Food Services Association*,
- [22] Sedioetama, A.D. Ilmu Gizi untuk Mahasiswa dan Profesi. Jakarta: Dian Rakyat; 2008.
- [23] Roves, P. M. G., Zapico, P. G., Patterson, A. M., & Gutierrez, E. I. Nutrient Intake and Food Habits of Soccer Players: Analyzing the Correlates of Eating Practice. *Nutrients*, 2014; Vol. 6, No. 7, 2697-2717. Diakses pada tanggal 17 November 2017 dari <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4113765/>
- [24] Sa'adah, R. H., Herman, R. B., & Sastri, S. Hubungan Status Gizi dengan Prestasi Belajar Siswa Sekolah Dasar Negeri 01 Guguk Malintang Kota Padangpanjang. *Jurnal Kesehatan Andalas*, 2014; 3 (3), 460-465.
- [25] Flores G, Bauchner H, Feinstein AR, Nguyen US. The impact of ethnicity, family income, and parental education on children's health and use of health services. *Am J Public Health* 1999; 89(7):1066-71)
- [26] Naik, SR., Itagi, SK., & Patil, M. Relationship between Nutrition Status, Intelligence and Academic Performance of Lambani School Children of Bellary District, Karnataka. *International Journal of Farm Sciences*, 2015; Vol. 5, No. 3
- [27] Opoola F, Adebisi SS and Ibegbu AO (2016). The study of nutritional status and academic performance of primary school children in Zaria, Kaduna State, Nigeria. *Ann Bioanthropol*. Vol 4 pp 96-100.
- [28] Dey AK and Nath AB (2017). Nutritional status of school going children (6-15 years) in a semi-urban area of Cachar district, Assam. *J. Evolution Med. Dent. Sci*. Vol 6 No 54 pp 4057-4062.
- [29] Agarwal A, Jain S, Garg SK, Chopra H and Bano T (2018). Prevalence of malnutrition and its impact on scholastic performance among 8–12-year children from 2 schools of urban Meerut. *Journal of Medical and Allied Sciences*. Vol 8 No 1 pp 1-6
- [30] Acharya Y, Luke N, Haro MF, Rose W, Russell PSS, Oommen AM and Minz S (2019). Nutritional status, cognitive achievement, and educational attainment of children aged 8-11 in rural South India. *PLoS ONE* Vol 14 No 10 pp 1-15.
- [31] Okafor AM, Odo EO and Onodigbo EO (2020). Dietary diversity: association with academic performance and anthropometric indices of rural Nigerian school children. *Pakistan Journal of Nutrition*. Vol 19 pp 61- 67.
- [32] Alaimo, K., Olsom, C., & FiongiM-C, E. (2001). Food insufficiency and American school-aged children's cognitive, academic, and psychosocial development. • *America Academic of Pediatrics*, 108(1), 44-53
- [33] Levinger, B. (1996). The effects of health and nutrition on a child's school performance. *Nutrition, Health and Education for All*. (<http://www.edc.org/GLG/NHEA/effecn.html>).
- [34] Bryan, J., Osendarp, S., Hughes, D., Calvaresi, E., Baghurst, K., & Klinke, J. (2004). Nutrients for cognitive development in school-aged children. *Nutrition Reviews*, 62(8), 295-300.