

# Relationship between Healthy Nutrition and Academic Performance of Students at Primary School Level: An experimental study

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## ABSTRACT

This study was designed to see the relationship between the nutritional status and academic performance among primary school children in selected villages of the District Jamshoro, Sindh Province, Pakistan. This was an experimental study. A total of (2) schools and (40) class-three students of age 8 years were selected randomly. Anthropometric measurement data were taken of each student applying the standard tools recognized by the World Health Organization. Data were collected through the questionnaire and student achievement test; collected data were analyzed in SPSS. Descriptive and inferential statistics were applied. Results of BMI and SAT scores were compared and interpreted. The study found that there was a significant difference in the mean score of the students marks and BMI before and after the treatment. This revealed that a low level of academic performance was significantly higher ( $p < 0.05$ ) among the underweight students than that of the healthy weight students. Malnutrition is a harmful factor which affects the lives of children and prevents them from engaging in mental and physical activities for which their learning is not effective. Collaboration between NGOs working on the health and Govt. health department and education department is required to eradicate the problem of malnutrition.

## Keywords

Malnutrition, Academic Performance, Anthropometric measurement, BMI Score, Primary school students.

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## Introduction

Malnutrition today is a burning issue which is increasing in students of public sector schools in Pakistan. As a developing country, it is significant to discuss on this burning issue to get a healthy future for public sector school students in the country. A country having the status of a developing nation cannot afford its next generation to be sick and dull. Quality education is very helpful in socio-economic and political awareness, proper nutrition plays an important role in the physical and mental development of the child throughout life (Amcoff, 1981). The lack of proper nutrition has a significant effect on the performance of the child, often the child is weak due to poor nutrition, and he does not pay enough attention in school (Groce et al., 2014). Malnutrition affects a child's ability to learn and his performance in school remains lower than that of other children, which often leads to a dropout ratio (Bagilkar & Savadatti, 2015). Malnutrition is one of the most prevalent public health issues that

is affecting the academic performance of children (Sargana & Mohyuddin, 2013). The responsibility of Government, Parents, teachers, and schools is very crucial in controlling malnutrition in school-going children. Malnutrition is one of the worst forms of human deprivation. Especially school children are more affected. Pakistan is one of the few countries in South Asia where malnutrition is more vulnerable and the nutritional status of the school children is very poor and compromised in public schools (Sawaya, 2006).

Malnutrition is not a problem of any single or underdeveloped country, but it is a prevalent problem that destroys all age groups with the largest population, but the problem is mainly more vulnerable between school children and young is very important Worldwide. Globally, half of all under-five deaths are due to malnutrition, with approximately 62.6 million deaths worldwide each year (FAO, IFAD, UNICEF, 2020). According to the World Food Program (2017), approximately 3.3 million child deaths are the

result of malnutrition. There are about 60 million children with moderate to severe malnutrition (13) million worldwide with simple intense nutrition (FAO, IFAD, UNICEF, WFP, & WHO, 2017). According to the joint estimate Report (2018), Globally, it is reported that one fifty-million children under the age of 5 years in 2017 are found remarkable. They have stunted growth they were looking too little for their real age. It is also reported that (50.5) Millions of children under the age of 5 have been found wasting in 2017 (much thinner than the actual age) Worldwide. Africa was thought to be a centre of malnutrition, but it is a great surprise that 70% of the world's malnourished children live in Asia (FAO, IFAD, UNICEF, 2020). In 2017 Half of the 150 million stunt children live in Asia and from that 58.7 million children live in South Asia. More than one third 1/3 of those reported in Africa. It is also reported that about two-thirds of wasting children live in Asia and more than half of the wasting means a total of 26.9 One million children live in South Asia and more than a quarter in Africa (Asia et al., 2017).

The situation of the malnutrition in the South Asia region is also not good. There is the highest rate of i

n 2016 and 2019 (Unicef, FAO, Acted, HANDS, IOM, WFP, WHO, DFID, 2019). Pakistan has faced many disasters in its history that's why it is called a disaster Developed country in the world and regular acquaintance in numerous disasters. The country, which has been suffering from so many misfortunes and hardships since its inception, has been further aggravated by Covid-19 and the recent 2020 urban and rural floods have worsened the situation and caused more children to suffer (Me, Angela, 2020). Currently half of the children in the country are malnourished, they are much shorter than their actual age, almost (49.8%) children are reported as a victim of stunted growth. Whereas (17.5%) are severely malnourished, they are considered as wasting (Government of Pakistan & UNICEF

malnourished children in the world. It was reported that there are about 46% of children aged 0-5 years are malnourished in the South Asia region. This percentage of malnutrition is more than in Africa, where 26% of children are aged 0-5 are found to be malnourished. The percentage of malnourished children is more in Bangladesh and India as compared to the courtiers of Kenya, Tanzania, and Africa. Countries in South Asia includes India, Bangladesh, Pakistan, Afghanistan and Nepal are among the most affected countries in the position of malnutrition in the world where 90% of malnutrition problem exists (Unicef, 2017). The condition of Pakistan is also very bad in terms of malnutrition. Nutrition is also one of the most neglected aspects of human development in Pakistan. According to Asia Hunger Report (2019), Pakistan is the second most important country in South Asia where the infant mortality rate is high. Forty 40% percent of children under the age of five are malnourished, this is the highest percentage of children under the age of five in the world. In 2020 there are 60 children die per 1000 women population which is a declined from 81

Pakistan, 2019). This number may be further increased due to the recent situation of COVID-19 and urban-rural floods due to the heavy monsoon. The situation is particularly dire in Sindh, where it has affected about 50 percent of children - and the number is growing, especially in flood-affected areas (Global Nutrition Report & Sustainable Development, 2020). According to UNICEF (2015), 72% of households are food insecure in Sindh (Unicef, 2015). As a result of heavy monsoon rains and floods in 2020, Sindh suffered considerable losses of about 2,14,521 households, 10,94,150 acres of agricultural land, and 45,961 livestock. As a result, there is a risk of further malnutrition (PDMA, 2020).

The floods, which occurred in 2010 have affected millions of people in Pakistan, in 2010 flood an estimated 20 million people were directly affected and more than 1700 people had lost their lives. About 12 lacs of houses were also destroyed (PDMA Govt of Sindh, 2010). The result of these floods was extraordinary Unjustified losses have a major impact on livelihoods and food security. According to the National Nutrition Survey (2018) stated that “one-third of all children are reported as underweight, about 40.2% of children have stunted growth and 17.7% are reported as wasted (Government of Pakistan & UNICEF Pakistan, 2019). According to the World Health Organization (2018). 60% under five years of age children die due to malnutrition in developing countries. From the year 2018 till today in Pakistan, the food items have become very expensive and have been touching the sky, as a result of which basic food items have become more expensive, and because of this inflation, the problem of malnutrition in children has become more complicated in poor families (FAO, IFAD, UNICEF, 2020). According to a World Resources Institute (WRI) report at present, food prices rise in Pakistan is repeatedly at 15.49 percent, hammering the poor the toughest, according to the State Bank of Pakistan June 2020, the inflation rate is increased from last year and it is now is 11.6% this is the highest in last 9 years. From 2019 to 2020, locusts in Pakistan will continue to be a major problem for rural people, which has led to food shortages in Pakistan and increased imports of food grains and vegetables from outside the country and for this reason the poor got into more trouble because of the reparations of locusts (Unicef, FAO, Acted, HANDS, IOM, WFP, WHO, DFID, 2019).

Life is difficult for people living in the Jamshoro district of Sindh province. It is also one of the backward districts of Sindh province. Food insecurity, lack of water resources, and lack of basic health facilities have negatively affected the lives and well-being of communities in the

district. Malnutrition is not a problem of today, it has been there for years. Malnutrition is common in every almost every third child and many such studies have been done by UNICEF and other sources which have proved that the problem of malnutrition is very old in this district and it is increasing daily (Di Cesare et al., 2015). The reason for this is that rainfall is very low here, and the second inflation rate has risen so much that it is very difficult for a man to feed his children properly. This has caused a lot of trouble for the common man and he has been struggling to make ends meet for a while now. The total number of malnourished children is 47%. Nearly 400 children die each year due to malnutrition in District Tharparkar of Sindh province (Unicef, FAO, Acted, HANDS, IOM, WFP, WHO, DFID, 2019).

### Statement of the problem

This is the best way to breastfeed a child and get the right nutrition at the right time. Children get good health by eating at the right time, Proper nutrition is very important for a child's growth and mental development. Children with proper nutrition are more functional in society and they perform well in school. Proper rearing and caring of children make them strengthens and well equipped for future global challenges as defined in the SDGs. Malnutrition deprived the children of good health and education.

### Objective

The purpose of this study is to see the relationship between the nutritional status and academic performance among primary school children in selected villages of the District Jamshoro, Sindh Province.

### Hypotheses

**H01:** There is no statistically significant difference between mean BMI scores of the control group and the experimental group on the pre & post-test.

**H02:** There is no statistically significant difference between mean achievement scores of

the control group and the experimental group on the pre-test in student's achievement test.

**H03:** There is no statistically significant difference between the mean achievement scores of the control group and the experimental group on the post-test in a student's achievement test.

**H04:** There is no statistically significant difference between mean achievement scores of the control group on the pre-test and post-test in a student's achievement test.

**H05:** There is no statistically significant difference between mean achievement scores of the experimental group on the pre-test and post-test in a student's achievement test.

**Variables** Different kinds of variables were used in this experimental study.

**Independent Variables:** BMI Score.

**Dependent Variables:** post-test scores of SAT.

**Controlled Variables:** Duration of an experiment, Academic & Professional qualification of teacher, pedagogy, students average age, availability of facilities in the school including class furniture, light, windows for fresh air, water and washrooms and availability of Teachers, time, gender, level of class and content of the course.

## Methods

### Research Design

The study was experimental; and based on a pre-test, post-test control group. The researcher used a survey method for the collection of related information from the Government Primary schools' students in district Jamshoro. The population comprised of class 3 students 7-8 years of age from two selected schools located in rural areas of Jamshoro district. The present study was conducted among 40 students of class three, 20,20 from each school. The sampling technique used for the present study was random sampling. Data was collected by using anthropometric tools, a close-ended questionnaire, and a Student achievement test. In academic performance,

students of class three were assessed through their previous exam sheets, attendance records, average grades by the class teacher in the exams in a previous class with the following classification Excellent, Very Good, Satisfactory, Average, and not meet expectations.

### Administration of Tools

#### Data Collection procedure:

**Pre-Test:** A student achievement test was made with the help of class three syllabus which is being taught in the school prescribed by the bureau of curriculum Jamshoro Govt of Sindh. The topics were covered which were already taught by the class teacher from the subject of Sindhi, English, and Mathematics. The test was assigned a total of 100 marks and the Pre-test was administered before the start of the experimental study.

#### Treatment:

The same syllabus of class three prescribed by the bureau of curriculum Jamshoro was taught to both groups of the study e.g., experimental and control for the time of 3 months. The experimental group was facilitated with proper nutrition including a glass of pure milk in breakfast and proper lunch and dinner at their home by giving the food items and some money to their parents and the control group was taught without it. All the students of both groups were taught from 8.30 a.m. to 1.00 p.m. daily.

#### Post-test:

Post-test was administered to both groups e.g., experimental and control group after 3 months of the teaching of the specified syllabus of three subjects e.g., Sindhi, English, and Mathematics.

**The pattern** of the pre-test and post-test were of the same difficulty level, each test comprised of the reading comprehension, multiple-choice questions, and mathematical problems questions in the test. Both the pre-test and post-test had 100 marks.

#### Validation of the SAT:

The students' achievement test of pre-test and post-test conducted from both groups were discussed with the class teachers and were improved in the light of their opinion. The improved form of both tests was conducted from 10 students of class three who were not included in the sample for the pilot study and were further made some amendments in terms of difficulty level based on the pilot study.

### Data Analysis

Data obtained from the pre-test and post-test were managed, organized, and entered in SPSS software and then Frequencies, Percentages, Mean and Standard Deviation (SD), Standard Error were used as descriptive statistics; whereas Independent Samples t-test and Paired Samples t-test was used as inferential statistics to analyze the data.

## Results

### SECTION – 1: SOCIO-DEMOGRAPHIC CHARACTERISTICS

#### 1.1. Parents Profile

The first section of this study explains the socio-demographic characteristics of the parents and students:

1. The most observed group of qualification was Illiterate ( $n = 24$ , 60%) whereas ( $n = 11$ , 27%) respondents were primary, and ( $n = 5$ , 12%) secondary passed.
2. The most observed group of qualification of the mother was Illiterate ( $n = 26$ , 65%), whereas ( $n = 11$ , 27.50%) respondents were primary, and ( $n = 3$ , 7.50%) secondary passed.
3. The most observed category of the type of family was Joint ( $n = 26$ , 65%), whereas ( $n = 14$ , 35%) living in a nuclear family.
4. The most observed category of children in a household was 7-8 ( $n = 20$ , 50%), whereas ( $n = 11$ , 27.50%) respondents said they have 5-6 children and ( $n = 9$ , 22.50%)

respondents said that they have 9-10 children.

5. The most observed category of occupation of the father was Labourer ( $n = 20$ , 50%) whereas ( $n = 17$ , 42.50%) respondents were a farmer and ( $n = 2$ , 5%) respondents have a private job such as security guard and some low category jobs in an NGOs and ( $n = 1$ , 2.50%) respondents working a Govt. employee.
6. The most observed category of occupation of the mother was a labourer ( $n = 34$ , 85%).
7. The most observed category of monthly wages was 6000-7000 ( $n = 18$ , 45%) whereas ( $n = 16$ , 40%) respondents earn 4000-5000 and ( $n = 5$ , 12.50%) respondents earn 8000-9000 and ( $n = 1$ , 2.50%) respondents earn only 2000-3000 on monthly basis.
8. The most observed category of meals served in a day was Two times meal (Breakfast+dinner) ( $n = 24$ , 60%) whereas ( $n = 9$ , 22.50%) respondents only serve the onetime meal they give only lunch to their children and ( $n = 7$ , 17.50%) respondents can only serve three times meal means they can serve to their children breakfast, lunch and dinner in a day. Table 1. shows the providing packed meal to their children for school in this regard the most frequently observed category of providing packed meals for school was No ( $n = 40$ , 100%).
9. The most observed category of farm animals was No ( $n = 26$ , 65%) whereas ( $n = 14$ , 35%) respondents have their cattle from which they fulfil their needs to some extent.
10. The most observed category of the source of water was Open-source water ( $n = 26$ , 65%) whereas ( $n = 14$ , 35%) use well-water.
11. The most observed category of knowledge regarding malnutrition is poor ( $n = 34$ ,



85%), whereas ( $n = 6$ , 15%) respondents know about the malnutrition to some extent.

12. The most observed category of causes of malnutrition was Poverty ( $n = 27$ , 68%) whereas ( $n = 13$ , 32%) respondents said that they have no knowledge and education because of illiteracy they cannot care their children.

**Table 1. 1. Socio-demographic characteristics of the parents**

<b>Qualification of Father</b>	<b><i>n</i></b>	<b>%</b>
Illiterate	24	60.00
Primary	11	27.50
Secondary	5	12.50
<b>Qualification of Mother</b>	<b><i>n</i></b>	<b>%</b>
Illiterate	26	65.00
Primary	11	27.50
Secondary	3	7.50
<b>Type of Family</b>	<b><i>n</i></b>	<b>%</b>
Joint	26	65.00
Nuclear	14	35.00
<b>Children in the HH</b>	<b><i>n</i></b>	<b>%</b>
5-6	11	27.50
7-8	20	50.00
9-10	9	22.50
<b>Occupation of Father</b>	<b><i>n</i></b>	<b>%</b>
Farmer	17	42.50
Labourer	20	50.00
Private Job	2	5.00
Govt. Employee	1	2.50
<b>Occupation of mother</b>	<b><i>n</i></b>	<b>%</b>
Farmer	4	10.00
Private Job	2	5.00
Labourer	34	85.00
<b>Monthly Wages</b>	<b><i>n</i></b>	<b>%</b>
4000-5000	16	40.00
6000-7000	18	45.00
8000-9000	5	12.50
2000-3000	1	2.50
<b>Meal serves in a day</b>	<b><i>n</i></b>	<b>%</b>
One-time meal (No	9	22.50

breakfast only lunch)		
Three times meal (Breakfast+lunch+dinner)	7	17.50
Two times meal (Breakfast+dinner))	24	60.00
<b>Providing a packed meal for school</b>	<b><i>n</i></b>	<b>%</b>
No	40	100.00
<b>Farm Animals</b>	<b><i>n</i></b>	<b>%</b>
Yes	14	35.00
No	26	65.00
<b>Source of Water</b>	<b><i>n</i></b>	<b>%</b>
Well water	14	35.00
Open-source water	26	65.00
<b>Knowledge about malnutrition</b>	<b><i>n</i></b>	<b>%</b>
Poor	34	85.00
Satisfactory	6	15.00
<b>Causes of malnutrition</b>	<b><i>n</i></b>	<b>%</b>
Poverty	27	67.50
Illiteracy	10	25.00
Lack of Knowledge	3	7.50

*Note: N= 40*

## 1.2. STUDENTS PROFILE

1. The most observed category of Age was 8 years ( $n=20$ , 100%).
2. The most observed category of Gender was Male ( $n = 28$ , 70%) and ( $n=12$ ,30%) Female.
3. The most frequently observed category of attendance was Regular to great extent ( $n = 21$ , 52%), and ( $n=13$ ,32.50%) students were regular to some extent, it means the majority of the students remain present in the school and on the other hand ( $n=5$ , 12.50%) remain to absent some time, ( $n=1$ , 2.50%) students remain absent frequently.
4. The most frequently observed category of previous exam grade was Average ( $n = 15$ , 38%), and the second most frequent category of previous exam grade was

Satisfactory ( $n= 14$ , 35%), and there were ( $n=5$ , 12.50%) students found very good and ( $n=3$ , 7.50%) not meet the expectations.

5. The data represent the observations for Weight for Age had an average of ( $M=16.82$  kg,  $SD = 2.73$ ).
6. The observations for Height for Age had an average of ( $M=115.85$  cm,  $SD = 4.20$ ).
7. The most observed category of BMI was Underweight ( $n = 31$ , 78%) and Healthy weight ( $n = 9$ , 22.50%).
8. The average marks of the students were ( $M=27.20$ ,  $SD= 13.76$ ).
9. The average marks of SAT in the post-experimental test of the experimental group were ( $M=52.75$ ,  $SD= 18.71$ ).
10. The average marks of SAT in the post-experimental test of the control group were ( $M=27.85$ ,  $SD=20.40$ ).

#### 11. Table No.2.1 Characteristics of the students

Variable	<i>n</i>	%
Age		
7	0	0.0
8	40	100
Gender		

Male	28	70.00
Female	12	30.00
<b>Grade</b>		
Three	40	100.00
<b>Attendance</b>		
Regular to a great extent	21	52.50
Regular to some extent	13	32.50
Remain to absent some time	5	12.50
Remain absent frequently	1	2.50
<b>Previous Exam grade</b>		
Very good	5	12.50
Excellent	3	7.50
Satisfactory	14	35.00
Average	15	37.50
Not meet expectations.	3	7.50

Note:  $N= 40$

## SECTION – 2: RESULT OF THE STUDENTS BEFORE THE EXPERIMENTAL STUDY

Table 2.1. Group Statistics Table for Weight of the students

Weight (pre-test score)	<i>M</i>	<i>SD</i>	<i>n</i>	<i>SE<sub>M</sub></i>	Min	Max	Skewness	Kurtosis
School-1	16.3	3.2	20	0.72	10	24	0.93	0.88
School-2	17.3	2.0	20	0.46	14	22	0.44	-0.39

The result of the summary statistics table shows the data for School-1, the observations of weight had an average of 16.30 ( $SD = 3.24$ ). For School-

2, the observations of weight had an average of 17.35 ( $SD = 2.06$ ).

Table 2.2 Group Statistics Table for Height in centimetres of the students

Height in cm (pre-	<i>M</i>	<i>SD</i>	<i>n</i>	<i>SE<sub>M</sub></i>	Min	Max	Skewness	Kurtosis
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test score)								
School-1	115.6	3.34	20	0.75	110	122	0.17	-0.73
School-2	116.0	4.99	20	1.12	110	128	0.50	-0.26

The result of the summary statistics table shows the data for School-1, the observations of height had an average of 115.65 cm ( $SD = 3.34$ ). For School-2, the observations of height had an average of 116.05 cm ( $SD = 4.99$ ).

**Table 2.3 Body-Mass-Index of the Students**

BMI	n	%
Underweight	31	77.50
Healthy Weight	9	22.50

Note:  $N = 40$

**Table 2.4 Crosstab for BMI and gender of the students**

BMI	Male	Female
Underweight (wasted & stunted)	21 (75%)	10 (83%)
Healthy Weight	7 (25%)	2 (17%)

Table No. 2.4 shows the frequencies and percentages calculated for the BMI split by the gender of the students of class-three in this regard for Male, the most frequently observed category of BMI was Underweight ( $n = 21$ , 75%). For females, the most frequently observed category of BMI was Underweight ( $n = 10$ , 83%).

**Table 2.5 Crosstab for BMI and Academic Achievement in the previous exam of the students.**

BMI	Very good	Excellent	Satisfactory	Average	Not meet expectations.
Underweight	2 (40%)	0 (0%)	12 (86%)	14 (93%)	3 (100%)
Healthy Weight	3 (60%)	3 (100%)	2 (14%)	1 (7%)	0 (0%)

Table No. 2.5 shows the frequencies and percentages calculated for the BMI split by the academic achievement in the previous class e.g. class-two in this regard for Very good, the most frequently observed category of BMI was Healthy Weight ( $n = 3$ , 60%). Excellent, the most frequently observed category of BMI was Healthy Weight ( $n = 3$ , 100%). For Satisfactory, the most frequently observed category of BMI was Underweight ( $n = 12$ , 86%). For Average, the most frequently observed category of BMI was Underweight ( $n = 14$ , 93%). For Not meet expectations., the most frequently observed category of BMI was Underweight ( $n = 3$ , 100%).

**Table 2.6 Group statistics of Average SAT marks**

SAT pre-test Marks	M	SD	n	SE <sub>M</sub>	Min	Max	Skewness	Kurtosis
School-1	25.00	14.01	20	3.13	8.00	65.00	1.17	1.30
School-2	29.40	13.50	20	3.02	10.00	50.00	0.09	-1.46

Table No. 2.6. shows the descriptive overview of the marks in this regard for School-1, the observations of SAT Marks had an average of 25.00 ( $SD = 14.01$ ), for School-2, the observations

of SAT Marks had an average of 29.40 ( $SD = 13.50$ ).



## SECTION – 3: RESULT OF THE EXPERIMENTAL STUDY

*Table 3.1 Group Statistics Table for Weight of the students*

Weight (post-test score)	<i>M</i>	<i>SD</i>	<i>n</i>	<i>SE<sub>M</sub></i>	Min	Max	Skewness	Kurtosis
Control group	16.88	3.13	20	0.70	12.00	25.00	1.27	1.16
Experimental group	23.20	2.40	20	0.54	18.00	28.00	-0.10	-0.09

The result of the summary statistics table shows the data for Control-group, the observations of weight had an average of 16.88 ( $SD = 3.13$ ). For Experiment-group, the observations of weight had an average of 23.20 ( $SD = 2.40$ ).

*Table 3.2 Group Statistics Table for Height in centimetres of the students*

Height in cm (post-test score)	<i>M</i>	<i>SD</i>	<i>n</i>	<i>SE<sub>M</sub></i>	Min	Max	Skewness	Kurtosis
Control group	115.88	3.36	20	0.75	112.00	120.00	0.14	0.81
Experimental group	118.90	3.71	20	0.83	115.00	125.00	0.61	1.11

The result of the summary statistics table shows the data for Control-group, the observations of height had an average of 115.88 cm ( $SD = 3.36$ ). For Experimental-group, the observations of height had an average of 118.90 cm ( $SD = 3.71$ ).

*Table 3.3 Group Statistics Table for BMI rank of the student's pre & post-test.*

Variable	<i>n</i>	%
<b>BMI_ (pre-test score)</b>		
Healthy Weight	9	22.50
Underweight	31	77.50
<b>BMI (post-test score)</b>		
Healthy weight	21	52.50
Underweight	17	42.50
Overweight	2	5.00

Table no. 3.3. shows the outcome of pre & post-test score of the Body-Mass index of the students in this regard the most frequently observed category of BMI before the experimental study was Underweight ( $n = 31$ , 78%), whereas ( $n = 9$ , 22.50%) students found healthy according to their weight, height, and age. On the other hand, the result of the Body-Mass index after conducted the experimental study in this regard the most frequently observed category of BMI rank was found Healthy weight ( $n = 21$ , 52%).

## SECTION – 4: HYPOTHESES TESTING

**HO<sub>1</sub>: There is no statistically significant difference between mean BMI scores of the control group and the experimental group on the pre & post-test.**

**Table 4.1 Two-Tailed Independent Samples *t*-Test for BMI pre-test by group**

Variable	School-1		School-2		<i>t</i>	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
BMI pre-test score	1.20	0.41	1.25	0.44	-0.37	.714

The outcome of the two-tailed independent samples *t*-test was not statistically significant based on an alpha value of 0.05,  $t(38) = -0.37$ ,  $p = .714$ , representing the null hypothesis cannot be rejected. The finding recommends the mean of BMI pre-test score was not significantly different between the School-1 and School-2 categories of the group.

**Table 4.1.1 Two-Tailed Independent Samples *t*-Test for BMI post-test by group**

Variable	Control group		Experimental group		<i>t</i>	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
BMI post-test score	1.20	0.41	2.05	0.39	-6.68	<.001

The outcome of the two-tailed independent samples *t*-test was statistically significant based on an alpha value of 0.05,  $t(38) = -6.68$ ,  $p < .001$ , representing the null hypothesis is rejected. This finding shows the mean of BMI post-test score was significantly different between the Control-group and Experimental-group categories of group school-1 & school-2.

**HO<sub>2</sub>:** There is no statistically significant difference between mean achievement scores of the control group and the experimental group on the pre-test in student's achievement test.

**Table No.4.2 Two-Tailed Paired Samples *t*-Test for the Difference Between School-1 and School-2**

School-1	School-2
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<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>
25.00	14.01	27.85	20.40	-0.49	.632

The outcome of the two-tailed paired samples *t*-test was not significant based on an alpha value of 0.05,  $t(19) = -0.49$ ,  $p = .632$ , representing the null hypothesis is rejected. The finding recommends the difference in the mean of School-1 and the mean of School-2 was not significantly different from zero.

**HO<sub>3</sub>:** There is no statistically significant difference between the mean achievement scores of the control group and the experimental group on the post-test in a student's achievement test.

**Table 4.3 Average SAT marks after conducted the experimental study**

SAT Marks Post	<i>M</i>	<i>SD</i>	<i>n</i>	<i>S.E.</i>	<i>M</i> in	<i>M</i> ax	Ske wne ss	Kur tosi s
Control group	27.85	20.40	20	4.56	0.00	80	1.10	0.47
Experimental group	52.75	18.71	20	4.18	0.00	82	0.58	0.05

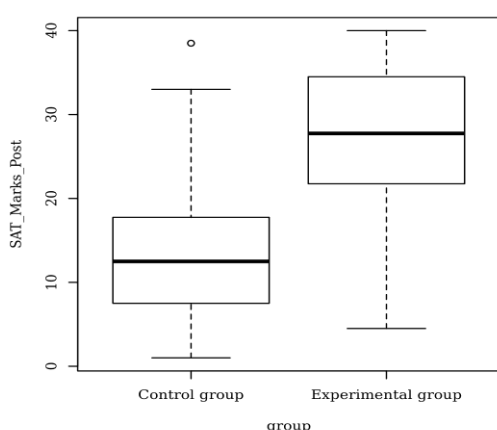
Table No. 4.3. shows the descriptive overview of the marks in this regard for the control group, the observations of SAT Marks had an average of 27.85 ( $SD = 20.40$ ), for the Experimental group, the observations of SAT Marks had an average of 52.75 ( $SD = 18.71$ ).

**Table 4.3.1 Two-Tailed Independent Samples *t*-Test for SAT Marks (post-test) by group**

Variab	Control group		Experimental group		<i>t</i>	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		

le						
SAT						
Marks	27.8	20.4	52.7	18.7	-	<
(post-test)	5	0	5	1	4.0	.00
					2	1

The outcome of the two-tailed independent samples *t*-test was statistically significant based on an alpha value of 0.05,  $t(38) = -4.02$ ,  $p < .001$ , representing the null hypothesis is rejected. The finding recommends the mean of SAT Marks (post-test) was significantly different between the Control group and the Experimental group.



**HO<sub>4</sub>:** There is no statistically significant difference between mean achievement scores of the experimental group on the pre-test and post-test in a student's achievement test.

**Table 4.4 Two-Tailed Paired Samples *t*-Test for the Difference Between pre & post-experimental group**

Experimental pre-SAT score		Experimental post-SAT score		<i>t</i>	<i>p</i>	<i>d</i>
<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
29.40	13.50	52.75	18.71	-4.71	<.001	1.05

The outcome of the two-tailed paired samples *t*-test was significant based on an alpha value of 0.05,  $t(19) = -4.71$ ,  $p < .001$ , representing the null hypothesis is rejected. This finding recommends the difference in the mean of the Experimental Pre-SAT score and the mean of Experimental

post-SAT score was significantly different from zero. The mean of the Experimental Pre-SAT score was significantly lower than the mean of the Experimental post-SAT score.

**HO<sub>5</sub>:** There is no statistically significant difference between mean achievement scores of the control group on the pre-test and post-test in a student's achievement test.

**Table 4.5 Two-Tailed Paired Samples *t*-Test for the Difference Between pre & post control group**

Control pre-SAT score		Control post-SAT score		<i>t</i>	<i>p</i>
<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
25.00	14.01	27.85	20.40	-0.49	.632

The outcome of the two-tailed paired samples *t*-test was not significant based on an alpha value of 0.05,  $t(19) = -0.49$ ,  $p = .632$ , representing the null hypothesis cannot be rejected. The finding showing the difference in the mean of the Control Pre-SAT score and the mean of Control Post-SAT score was not significantly different from zero.

## Conclusion

The study found that primary school children in the villages of district Jamshoro showed signs of malnutrition. Food insecurity, lack of water resources, and lack of basic health facilities have negatively affected the lives and well-being of communities in the district. Malnutrition is not a problem of today, but it has been there for many years due to many social, political, and environmental issues. The study revealed that proper nutrition improves students' academic performance. When students eat the right food according to standard health guidelines, then children respond and work better physically and mentally. The severe prevalence of malnutrition in children was due to a deficiency of minerals and vitamins, lack of awareness, larger families, food

insecurity, decreased rainfall, and barren land. The study also revealed that primary school children in the selected villages of District Jamshoro, Sindh, Pakistan showed signs of malnutrition. BMI, height, and weight scores showed a significant correlation with academic performance. Students who were provided with a good and balanced diet were more likely to focus on the lesson than those who were hungry. When students suffer from malnutrition, their mental, intellectual and emotional states vary, which can have a negative effect on students' mental development. Hence, there is a need for social, economic, political, and personal development changes to improve our children's nutritional status, and these changes can be made primary through good educational opportunities.

### Recommendations

The current study recommends that children's health and educational rights should be protected by government. Regular check-ups of children at school should be done by district health department with the collaboration of NGOs. Since polio teams are present at the districts, they should be given the responsibility of calculating each child's weight, height and BMI score, and such reports should be presented to the District Health Department, if a child in a school suffers from malnutrition, Health department with the collaboration of NGOs provide them with supplementary foods and aware the communities about the benefits of proper nutrition and harmful effects of malnutrition.

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