Impact of an Educational Intervention on Knowledge, Attitude and Practice (KAP) On Protein among University Students

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ABSTRACT— **Proteins are vital nutrients that are supportive of building and repairing tissues, growth, and overall health. Proteins are critical nutrients at a time of rapid growth, both physically and mentally, namely, during adolescence. This study was conducted among a cohort of girls who were attending college. The study aimed to assess their knowledge, attitudes, and practices related to protein. The primary approach was to have a short educational session that described the role of protein, sources of protein, and protein requirements in an uncomplicated and relevant manner. Many participants demonstrated limited awareness, as well as some limited misconceptions, before the intervention. Participants demonstrated a noticeable change in both their knowledge and attitude toward protein intake post-intervention. Overall the study demonstrates that even a single, carefully designed educational intervention can help young people to be better informed and make better decisions related to their food choices and nutritional value.**

*Keywords— **Dietary habits, educational intervention, health education, nutrition awareness, protein**

I. INTRODUCTION

Food and nutrition helps in maintaining human health and is important in the prevention of non-communicable diseases. Proteins play a significant role in the development of human beings and their growth and physiological functions. In general, each amino acid works in the synthesis and functioning of muscles and organs, enzymes, hormones, and the immune system. Protein also provides energy like carbohydrates and fat. 1 gram of protein provides 4kcals. (McAuliffe et al., 2022) Knowledge, Attitude, and Practice (KAP) studies serve as valuable tools to assess awareness and behaviours related to protein. In this study, university students' baseline knowledge, attitude, and practice (KAP) regarding protein were assessed using a structured questionnaire. Following this, an educational intervention in the form of a PowerPoint presentation was implemented to enhance their understanding. The effectiveness of the intervention was then evaluated by reassessing their KAP through the same questionnaire.

II. OBJECTIVES

1. To assess the baseline knowledge, attitude, and practice (KAP) of university students regarding protein.
2. To implement an educational intervention using a PowerPoint presentation.
3. To evaluate changes in students' KAP after the intervention to determine its effectiveness.

III. MATERIALS AND METHODOLOGY

Study Design
This study follows a Knowledge, Attitude, and Practice (KAP) survey design with a pre-post intervention approach. It aims to assess university students' understanding on protein before and after an educational intervention.

Study Population and Sampling
University students were the target population.

Table 1: Inclusion and Exclusion criteria

INCLUSION CRITERIA	EXCLUSION CRITERIA
Enrolled in the university at the time of the	Students who Are unwilling to provide

study.	informed consent or do not wish to participate in both pre- and post-assessments.
Willing to participate voluntarily.	Non-university students

Sample Size

A minimum of 39 participants will be included using a non-probability sampling method, i.e., convenience, Snowball.

Study Tool

A structured questionnaire was developed to assess knowledge, attitude, and practice on protein. It includes:

- Knowledge-based questions (multiple choice and true/false format).
- Attitude-based questions (5-point Likert scale).
- Practice-based questions (Yes/No responses).

Intervention

An educational intervention was conducted using a PowerPoint presentation, covering:

- What is protein
- Function of protein, RDA, sources (plant and animal based) and toxicity.
- Myths and facts about protein

Data Collection Procedure

1. Pre-intervention: Participants were asked to fill out the KAP questionnaire before receiving any information.
2. Intervention: A PowerPoint presentation was delivered to educate participants on protein.
3. Post-intervention: The same KAP questionnaire was asked to fill again to assess changes in knowledge, attitude, and practice.

IV.   RESULTS

Table 2: Frequency and percentage of demographic and anthropometry data of participants

VALUE	CATEGORY	FREQUENCY	PERCENTAGE
Age (years)	17-20	39	100
	21-25	-	-
Gender (M/F)	Female	39	100
Height (cms)	141-150	4	10.25
	151-160	24	61.5
	161-170	11	28.2
Weight (kgs)	31-40	5	12.8
	41-50	18	46.1
	51-60	9	23
	61-70	3	7.6
	71-80	4	10.25

1. Knowledge Assessment of Respondents

Table 1.1 Knowledge Assessments of the Respondents

Question	Pre-Test Correct Response Frequency (%) n=39	Post-Test Correct Response Frequency (%) n=39
What are proteins made of?	27 (69.2%)	37 (94.8%)
What is the main role of proteins in the body?	24 (61.5%)	25 (64.1%)
Which organ is responsible for producing digestive enzymes for protein?	25 (64.1%)	24 (61.5%)
Which food is a rich source of protein?	29 (74.3%)	28 (71.7%)
How many essential amino acids does the human body need?	19 (48.7%)	37 (94.8%)
Which of the following is a plant-based source of protein?	17 (43.5%)	23 (58.9%)
Which of these is NOT a function of proteins?	21 (53.8%)	22 (56.4%)
What is the daily protein requirement for an	11 (28.2%)	34 (87.1%)

average adult?		
What is the name of the protein found in red blood cells?	31 (79.4%)	33 (84.6%)
Which of the following is a complete protein?	28 (71.7%)	23 (58.9%)
What happens if the body does not get enough protein?	36 (92.3%)	36 (92.3%)

Table 1.2 Knowledge Assessments of the Respondents

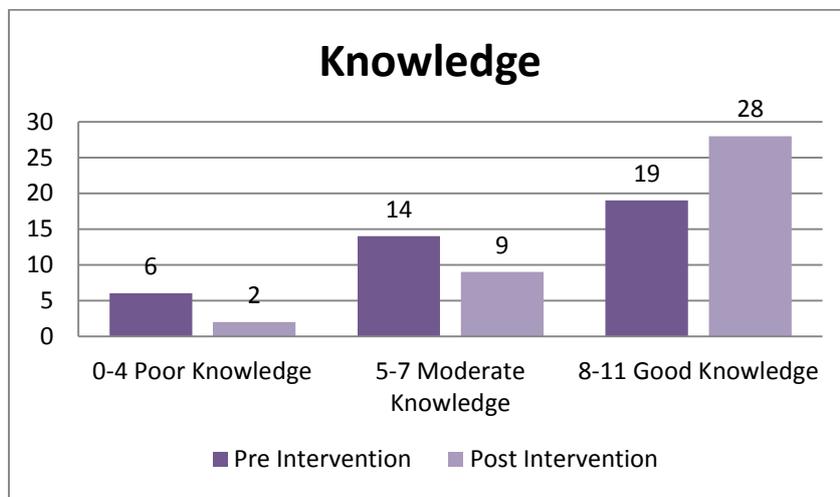| Knowledge	Pre Intervention Frequency Percentage (n=39)	Post Intervention Frequency Percentage (n=39)
0-4 Poor Knowledge	6 (15.3%)	2 (5.1%)
5-7 Moderate Knowledge	14 (35.8%)	9 (23%)
8-11 Good Knowledge	19 (48.7%)	28 (71.7%)

Figure 1.1 Knowledge levels of the Respondents

The table 1.2 represents the results of the pre- and post-intervention assessments reveal a significant improvement in participants' knowledge. The results indicate a positive shift in knowledge levels following the intervention. Before the intervention, 15.3% (n=6) of participants had poor knowledge, 35.8% (n=14) had moderate knowledge, and 48.7% (n=19) demonstrated good knowledge. After the intervention, the number of participants with poor knowledge significantly decreased to 5.1% (n=2), while those with moderate knowledge declined to 23% (n=9). Conversely, the percentage of participants with good knowledge increased substantially from 48.7% (n=19) to 71.7% (n=28).

2. Attitude Assessment of Respondents

Table 2.1 Attitude Assessments of the Respondents

Sr. No.	Questions		Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1.	Do you think plant-based proteins are as good as animal proteins?	Pre	8 (20.5%)	9 (23%)	16 (41%)	6 (15.3%)	0
		Post	15 (38.4%)	14 (35.8%)	6 (15.3%)	2 (5.1%)	2 (5.1%)
2.	Do you believe children need more protein than adults?	Pre	14 (35.8%)	11 (28.2%)	10 (25.6%)	4 (10.2%)	0
		Post	7 (17.9%)	11 (28.2%)	17 (43.5)	3 (7.6%)	1 (2.5%)

3.	Do you think eating too much protein can harm your health?	Pre	9 (23%)	8 (20.5%)	17 (43.5)	3 (7.6%)	2 (5.1%)
		Post	18 (46.1%)	11 28.2%)	4 (10.2%)	3 (7.6%)	3 (7.6%)
4.	Do you think proteins should be consumed more than fats and carbohydrates in meals?	Pre	6 (15.3%)	13 (33.3%)	16 (41%)	4 (10.2%)	0
		Post	5 (12.8%)	8 (20.5%)	18 (46.1%)	5 (12.8%)	3 (7.6%)
5.	Do you believe vegetarians can get enough protein from their diet?	Pre	11 (28.2%)	13 (33.3%)	9 (23%)	6 (15.3%)	0
		Post	14 (35.8%)	15 (38.4%)	7 (17.9%)	2 (5.1%)	1 (2.5%)
6.	Do you think protein-rich diets are expensive?	Pre	5 (12.8%)	7 (17.9%)	18 (46.1%)	5 (12.8%)	4 (10.2%)
		Post	4 (10.2%)	7 (17.9%)	18 (46.1%)	6 (15.3%)	4 (10.2%)
7.	Do you feel that protein needs vary based on age and activity levels?	Pre	12 (30.7%)	16 (41%)	7 (179%)	2 (5.1%)	2 (5.1%)
		Post	16 (41%)	14 (35.8%)	7 (17.9%)	2 (5.1%)	0
8.	Protein is an essential nutrient that our body needs to function properly.	Pre	22 (56.4%)	13 (33.3%)	4 (10.2%)	0	0
		Post	19 (48.7%)	16 (41%)	3 (7.6%)	1 (2.5%)	0
9.	Eating a lot of protein can help you build muscles faster.	Pre	7 (17.9%)	7 (17.9%)	17 (43.5%)	6 (15.3%)	2 (5.1%)
		Post	5 (12.8%)	14 (35.8%)	10 (25.6%)	7 (17.9%)	3 (7.6%)
10.	Protein supplements are necessary for everyone who works out regularly.	Pre	8 (20.5%)	14 (35.8%)	11 (28.2%)	4 (10.2%)	2 (5.1%)
		Post	10 (25.6%)	10 (25.6%)	12 (30.7%)	5 (12.8%)	2 (5.1%)
11.	Eating more protein will always result in faster weight loss.	Pre	1 (2.5%)	6 (15.3%)	22 (56.4%)	6 (15.3%)	4 (10.2%)
		Post	5 (12.8%)	7 (17.9%)	15 (38.4%)	8 (20.5%)	4 (10.2%)
12.	Protein is important for maintaining healthy skin, hair, and nails.	Pre	19 (48.7%)	14 (35.8%)	5 (12.8%)	1 (2.5%)	0
		Post	21 (53.8%)	11 (28.2%)	6 (15.3%)	0	1 (2.5%)
13.	The body can store excess protein for later use, just like carbohydrates and fats.	Pre	8 (20.5%)	8 (20.5%)	17 (43.5%)	4 (10.2%)	2 (5.1%)
		Post	6 (15.3%)	10 (25.6%)	18 (46.1%)	3 (7.6%)	2 (5.1%)
14.	All protein sources provide the same amount of benefit to the body, regardless of their source.	Pre	1 (2.5%)	8 (20.5%)	10 (25.6%)	18 (46.1%)	2 (5.1%)
		Post	8 (20.5%)	10 (25.6%)	16 (41%)	4 (10.2%)	1 (2.5%)

15.	Protein is only needed by people who are trying to lose weight or build muscle.	Pre	0	2 (5.1%)	13 (33.3%)	12 (30.7%)	12 (30.7%)
		Post	6 (15.3%)	6 (15.3%)	12 (30.7%)	7 (17.9%)	8 (20.5%)

Table 2.2 Attitude Levels of the Respondents

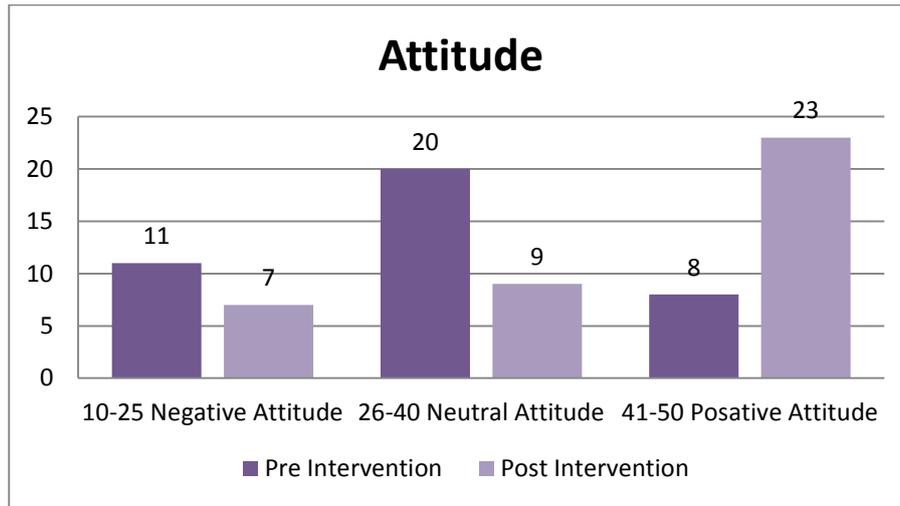| Attitude	Pre Intervention	Post Intervention
10-25 Negative Attitude	11 (28.2%)	7 (17.9%)
26-40 Neutral Attitude	20 (51.2)	9 (23%)
41-50 Positive Attitude	8 (20.5%)	23 (58.9%)

Figure 1.2 Attitude Levels of the Respondents

The table 1.4 represents the data on participants' attitudes towards the subject shows a clear shift towards more positive attitudes following the intervention. The results indicate a significant improvement in participants' attitudes following the intervention. Before the intervention, 28.2% (n=11) of participants exhibited a negative attitude, 51.2% (n=20) had a neutral attitude, and only 20.5% (n=8) demonstrated a positive attitude. After the intervention, the proportion of participants with a negative attitude decreased to 17.9% (n=7), while those with a neutral attitude dropped to 23% (n=9). Most notably, the percentage of participants with a positive attitude increased significantly from 20.5% (n=8) to 58.9% (n=23).

3. Practice Assessment of Respondents

Table 3.1 Practice Assessments of the Respondents

Sr. No.	Question		Yes	No
1.	Do you consume protein in every meal?	Pre	23 (58.9%)	16 (41%)
		Post	27 (69.2%)	12 (30.7%)
2.	Consuming eggs on daily basis?	Pre	6 (15.3%)	33 (84.6%)
		Post	11 (28.2%)	28 (71.7%)
3.	Do you eat dairy products like yogurt, cheese, or milk every day?	Pre	30 (76.9%)	9 (23%)
		Post	32 (82%)	7 (17.9%)
4.	You consume protein shakes & supplements to fulfil your daily requirement.	Pre	16 (41%)	23 (58.9%)
		Post	12 (30.7%)	27 (69.2%)
5.	Do you feel you are meeting your daily protein requirement based on your activity level?	Pre	3 (7.6%)	36 (92.3%)
		Post	10 (25.6%)	28 (71.7%)
6.	You avoid high protein foods to avoid gaining	Pre	6 (15.3%)	33 (85.3%)

	weight.	Post	12 (30.7%)	27 (69.2%)
7.	Do you prefer to get your protein from natural food sources rather than supplements?	Pre	33 (85.3%)	6 (15.3%)
		Post	31 (79.4%)	8 (20.5%)
8.	Do you check the protein content of packaged foods before purchasing?	Pre	15 (38.4%)	24 (61.5%)
		Post	16 (41%)	23 (58.9%)
9.	You feel like avoiding protein intake on the days you are not exercising.	Pre	6 (15.3%)	33 (85.3%)
		Post	13 (33.3%)	26 (66.6%)
10.	Do you consume milk on everyday basis?	Pre	24 (61.5%)	15 (38.4%)
		Post	25 (64.1%)	14 (35.8%)
11.	Do you eat beans or legumes (like black beans or lentils) regularly?	Pre	17 (43.5%)	22 (56.4%)
		Post	20 (51.2%)	19 (48.7%)
12.	Do you avoid protein-rich foods because you don't like the taste of them?	Pre	13 (33.3%)	26 (66.6%)
		Post	10 (25.6%)	29 (74.3%)

Table 3.2 Practice levels of the Respondents

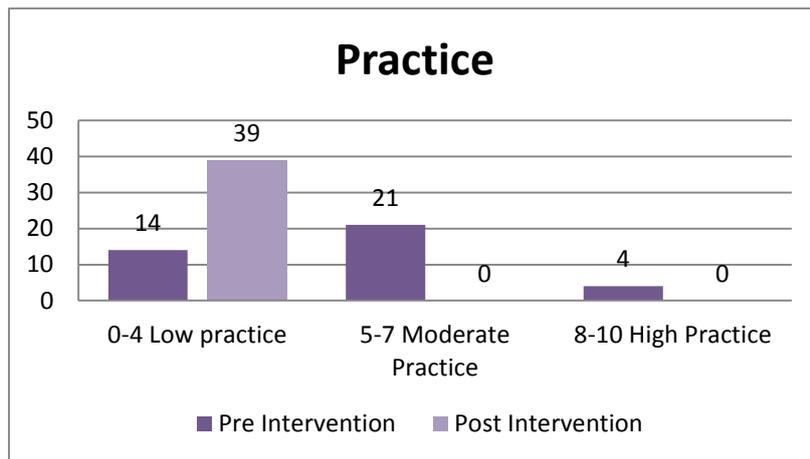| Practice	Pre Intervention	Post Intervention
0-4 Low practice	14 (35.8%)	
5-7 Moderate Practice	21 (53.8%)	
8-10 High Practice	4 (35.8%)	

Figure 1.3 Practice levels of the Respondents

The table 1.6 represents the data on participants' practice levels reveals significant changes in engagement with the subject matter following the intervention. The results indicate variations in participants' practice levels before and after the intervention. Prior to the intervention, 35.8% (n=14) of participants demonstrated low practice levels, 53.8% (n=21) had moderate practice, and only 10.3% (n=4) exhibited high practice. However, post-intervention data is missing, making it difficult to analyse the extent of improvement or change in practice levels.

V.   STATISTICAL ANALYSIS

Paired sample t-test between pre intervention and post intervention KAP
Paired Samples Test

		Paired Differences				t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference	Mean	Std. Deviation	Std. Error Mean

	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
Pair 1 preK - postK	.33333	.62126	.09948	.13194	.53472	3.351	38	.002
Pair 2 preA - postA	-.48718	.68333	.10942	-.70869	-.26567	-4.452	38	.000

This table presents the results of a paired sample t-test, which compares the means of two related groups. In your case, the comparisons are:

- Pair 1: Pre-K (before intervention) vs. Post-K (after intervention)
- Pair 2: Pre-A (before Activity) vs. Post-A (after Activity)

Here's the breakdown of the table's columns and what they mean:

Pair 1: Pre-K vs. Post-K

1. Mean:

The mean difference between preK and postK is 0.33333. This indicates that, on average, the postK score is 0.33333 higher than the preK score.

2. Standard Deviation (Std. Deviation):

The variability in the differences is 0.62126. This tells you how spread out the differences are around the mean difference

3. Standard Error Mean (Std. Error Mean):

The standard error of the mean difference is 0.09948. This measures how much the sample mean difference is likely to vary from the true population mean difference.

4. 95% Confidence Interval of the Difference:

Lower: The lower bound of the confidence interval is 0.13194, and the upper bound is 0.53472. This means we are 95% confident that the true mean difference (postK - preK) falls between 0.13194 and 0.53472.

5. t-value:

The t-statistic is 3.351, which represents how far the sample mean difference is from 0, in units of standard error. A larger t-value typically suggests a more significant difference.

6. Degrees of Freedom (df):

The degrees of freedom (df) are 38, which corresponds to the number of paired observations minus 1 (e.g., n - 1).

7. Sig. (2-tailed):

The p-value is 0.002, which is less than the typical significance level of 0.05. This means there is a statistically significant difference between preK and postK.

Pair 2: Pre-A vs. Post-A

1. Mean:

The mean difference between preA and postA is -0.48718. This indicates that, on average, the postA score is 0.48718 lower than the preA score.

2. Standard Deviation (Std. Deviation):

The standard deviation of the differences is 0.68333.

3. Standard Error Mean (Std. Error Mean):

The standard error is 0.10942.

4. 95% Confidence Interval of the Difference:

Lower: The lower bound is -0.70869, and the upper bound is -0.26567. This means we are 95% confident that the true mean difference (postA - preA) falls between -0.70869 and -0.26567.

5. t-value:

The t-statistic is -4.452, which is quite large in magnitude, suggesting a significant difference.

6. Degrees of Freedom (df):

Again, the degrees of freedom are 38.

7. Sig. (2-tailed):

The p-value is 0.000, which is less than 0.05. This indicates a statistically significant difference between preA and postA.

Summary:

☐ For Pair 1 (preK vs. postK), the mean difference is positive (0.33333), and the result is statistically significant (p = 0.002).

☐ For Pair 2 (preA vs. postA), the mean difference is negative (-0.48718), and the result is also statistically significant (p = 0.000).

VI. DISCUSSION

The objective of the study was to evaluate the efficacy of an educational intervention on knowledge, attitudes, and practice (KAP), towards protein consumption among young females aged 17-20. Knowledge and self-reported attitudes of 39 participants, evaluated before and after the intervention, indicated significant improvements. In regard to knowledge, correct responses increased substantially to key questions in the post-assessment (Gutjahr et al., 2023). Awareness of the number of essential amino acids increased from 48.7% to 94.8%. Awareness of daily protein needs increased from 28.2% to 87.1%. A paired t-test confirmed that

there was a statistically significant improvement in knowledge assessment (t = 3.351, p = 0.002), which indicates that the educational intervention improved knowledge about protein.

There was also a positive improvement in attitudes towards the importance of protein consumption (Zaman et al., 2021). In the pre-assessment, 20.5% of the participants had a positive attitude, whereas post-assessment 58.9% had a positive attitude. The acceptance of plant-based protein parity and animal protein also appeared to improve with pre-assessment agreement from 43.5% (combined "strongly agree" and "agree") to 74.2%. The changes in attitude scores were also statistically significant (t = -4.452, p = 0.000), suggesting that attitudes towards the importance of protein consumption improved as a result of the intervention.

In terms of practice, participants reported a greater frequency of protein consumption in their daily meals following the intervention. The percentage of participants who consumed protein with everyday meals increased from 58.9% to 69.2%. Additionally, the number of participants who reported that eating protein was satisfactory in meeting their protein intake increased from 7.6% to 25.6%. Moreover, the number of participants consuming legumes as part of their meal plan also increased from 43.5% to 51.2%. However, there was a small decrease in the practice of consuming protein shakes (from 41% to 30.7%), indicating a maybe shift in preference towards whole and natural forms of protein in their diet.

Demographically, all participants were females and were within a narrow age range (17–20), most of whom had a moderate weight and height distribution, contributing to the homogenous sample and study population evaluating the effects of educational effectiveness on educational impact within this narrow region of nutritional education. Overall, the findings support the effectiveness of the educational intervention on improved knowledge, attitudes, and practices about protein consumption for young females, highlighting the significance of educational nutrition education to promote healthier eating behaviours.

VII.   CONCLUSION

In conclusion, the study's findings provide optimal evidence of the educational intervention's effectiveness in improving young females' knowledge, attitudes, and practices on protein intake. The post-intervention data showed a clear increase in correct answers to knowledge-based questions, especially on essential amino acids and daily protein requirements. There were also positive changes in attitudes related to plant-based proteins, the importance of protein for overall health, and the adequacy of vegetarian diets. There were also positive shifts in dietary practice among participants who increased their consumption of protein-rich foods and felt that they were meeting their daily protein requirements. Therefore, the study's findings demonstrate the success of structured nutritional education in promoting awareness and initiating healthier dietary practices. Overall, this research demonstrates the benefits of focused health education programs for enabling individuals to make dietary decisions that promote long-term health.

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