

ASSESSMENT OF DEHYDRATION RISK FACTORS AND EFFECTIVENESS OF NUTRITION EDUCATION ON HYDRATION PRACTICES AMONG FARMERS¹Sangeetha P., ^{*2}Lally Hanna Luke¹Post Graduate Student, Department of Clinical Nutrition, MMM College of Health Sciences, Mogappair, Chennai, India.²Professor, Department of Clinical Nutrition, MMM College of Health Sciences, Mogappair, Chennai, India.

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Mogappair, Chennai, India.<https://doi.org/10.5281/zenodo.19337236>**How to cite this Article:**¹Sangeetha P., ²Lally Hanna Luke*. (2026). Assessment of Dehydration Risk Factors And Effectiveness of Nutrition Education on Hydration Practices Among Farmers. International Journal of Modern Pharmaceutical Research, 10(4), 52-57.**ABSTRACT**

The risk of dehydration among farmers is high due to increased exposure to hot environmental conditions. This study aims to assess the prevalence and risk factors associated with dehydration among farmers and evaluate the effectiveness of nutrition education program on hydration and healthy eating practices. The study included 73 farmers (40 males, 33 females) aged 18 to 90 years. Data on participants' demographics, anthropometrics, work environment, physical activity, and hydration practices were gathered. Urine samples were collected to measure urine specific gravity (values >1.020 indicate dehydration). A nutrition education program was conducted to assess the knowledge of the farmers and to create awareness about hydration and a well-balanced diet. The findings highlight that the prevalence of dehydration among farmers was 24.6 percent. Risk factors associated with dehydration include inadequate intake of water (less than 2 litres/day), excessive physical activity, medical conditions such as hypertension, increased consumption of caffeine and salty foods, lack of access to shade, lack of pre-work hydration, and excessive sweating. Following the nutrition education program, knowledge on hydration and healthy eating practices among farmers increased. The findings show that farmers are at risk of dehydration, awareness can be improved through proper nutrition education. Farmers are advised to drink enough water, follow a balanced diet, and take breaks in shaded areas. Improving access to clean drinking water and promoting healthy eating habits can help reduce dehydration.

KEYWORDS: Dehydration, farmers, prevalence, urine specific gravity, hydration practices, nutrition education.**INTRODUCTION**

Dehydration is a major concern for individuals performing physically demanding work in hot and humid environments, as the body loses significant amounts of water through sweating, which is an important mechanism for thermoregulation. The human body contains approximately 55-65% water, with two-thirds present inside cells and the remaining distributed in extracellular and intravascular compartments. Water plays a crucial role in maintaining various physiological processes, and excessive fluid loss can impair normal body functions and lead to serious health complications. Dehydration may occur due to illness, prolonged exposure to high temperatures, or intense physical activity combined with inadequate fluid intake, and in severe cases it can result in increased morbidity and mortality. Agriculture forms the backbone of the Indian economy, providing livelihoods for a large proportion of the population while contributing to food security, rural

development, and economic growth. Farmers often work under extreme environmental conditions and engage in strenuous physical labour, which increases the risk of dehydration due to excessive sweating and inadequate water replacement. Symptoms of dehydration among farm workers may include thirst, headache, muscle cramps, tachycardia, dizziness, and breathing difficulties, and prolonged dehydration can also affect mental health, causing agitation, anxiety, confusion, or even unconsciousness in severe cases. Maintaining adequate hydration is essential for proper thermoregulation and overall health, and preventive strategies such as regular water intake, resting in shaded or cooler areas, and wearing suitable clothing can help reduce dehydration risk. Proper nutrition and balanced diets rich in whole grains, legumes, fruits, vegetables, and nuts also contribute to overall health and well-being. Nutrition education and health promotion programs play a vital role in improving awareness about hydration and healthy

dietary practices, enabling individuals to make informed health decisions. Water, often described as a “silent nutrient,” is essential for digestion, nutrient absorption, temperature regulation, and optimal physical and mental performance. However, despite its importance, research on dehydration in India especially among vulnerable groups such as farmers remains limited, highlighting the need for greater attention to hydration within nutrition and public health programs.

METHODOLOGY

This study aimed to assess the prevalence of dehydration among farmers, identify the risk factors associated with dehydration, and evaluate the effectiveness of a nutrition education program on hydration and healthy eating practices. A cross-sectional study design was adopted to achieve these objectives. The study was conducted in Uchinatham, Ramanathapuram district, Tamil Nadu, over a period of three months. The study population consisted of 73 farmers, including 40 males and 33 females, aged between 18 and 90 years.

The inclusion criteria comprised farmers aged 18–90 years who were actively engaged in farming activities for at least six months, including those involved in crop farming, livestock farming, and mixed farming, and who were willing to participate and provide informed consent. Farmers below 18 years of age, those not engaged in farming activities for at least six months, and those unwilling to participate or provide informed consent were excluded from the study.

Data were collected using both primary and secondary sources. Primary data were obtained through structured interviews and questionnaires that gathered information on demographic characteristics (age, gender, education level, and years of farming), work environment, physical activity, hydration practices, and symptoms related to dehydration. Anthropometric measurements including height, weight, body mass index (BMI), waist circumference, and mid-upper arm circumference

(MUAC) were recorded using standard procedures. BMI was calculated using the formula weight (kg) divided by height (m²) and classified according to World Health Organization (WHO) standards. Information regarding medical history and occupational factors such as working hours, access to shade, and type of clothing worn during work was also collected.

Hydration status was assessed through urine analysis by measuring urine specific gravity using a urinometer. Participants were provided with sterile containers to collect urine samples, and urine specific gravity values ≥ 1.020 were considered indicative of dehydration. Information on daily water intake, consumption of beverages such as tea or coffee, intake of salty foods, and hydration practices during work was also recorded. Symptoms of dehydration, including thirst, fatigue, headache, dizziness, excessive sweating, and decreased urine output, were also assessed.

A nutrition education program focusing on hydration and healthy eating practices was implemented as part of the study. Educational sessions included information on the importance of adequate water intake, balanced diets, locally available nutrient-rich foods, and practical strategies to prevent dehydration during farm work. Visual aids such as charts, food pyramids, and pamphlets were used to enhance understanding. The effectiveness of the intervention was evaluated using structured pre- and post-test questionnaires to assess the participants’ knowledge regarding hydration and nutrition.

Statistical analysis was conducted to interpret the collected data. Descriptive statistics such as mean and standard deviation were used to summarize the data. The Chi-square test was applied to determine the association between hydration status and selected factors such as water intake and physical activity. A paired sample t-test was used to compare knowledge scores before and after the nutrition education intervention in order to evaluate its effectiveness.

RESULTS AND DISCUSSION

Table 1: Association between Body Mass Index (BMI) Classification and Hydration Status among Farmers.

BMI Classification	Hydrated		Dehydrated	
	Frequency	Percentage	Frequency	Percentage
Underweight	4	57.14%	3	42.86%
Normal weight	31	73.81%	11	26.19%
Overweight	20	83.33%	4	16.67%
Total	55	75.3%	18	24.7% %

Table 1 shows the distribution of farmers according to their Body Mass Index (BMI) classification and hydration status. Among the hydrated farmers, 57.14% were underweight, 73.81% were of normal weight, and 83.33% were overweight. In contrast, among the dehydrated farmers, 42.86% were underweight, 26.19% were of normal weight, and 16.67% were overweight. Overall, out of the total 73 farmers included in the study,

55 farmers (75.3%) were adequately hydrated, while 18 farmers (24.7%) were found to be dehydrated.

The results indicate that dehydration was observed across all BMI categories, although a comparatively higher proportion of dehydration was seen among underweight and normal weight farmers compared to overweight farmers. This suggests that hydration status may vary

across different nutritional status groups among the farming population.

Table 2: Distribution of Waist Circumference and Mid-Upper Arm Circumference (MUAC) in Relation to Hydration Status among Farmers.

Measurement Category	Sub-Category	Hydrated (n)	Hydrated (%)	Dehydrated (n)	Dehydrated (%)
Waist Circumference (Male)	Normal (<94 cm)	21	70.0	9	30.0
	Moderate (94–102 cm)	6	66.67	3	33.33
	High (>102 cm)	1	100.0	0	0
Waist Circumference (Female)	Normal (<80 cm)	4	80.0	1	20.0
	Moderate (80–88 cm)	14	87.5	2	12.5
	High (>88 cm)	9	75.0	3	25.0
Mid-Upper Arm Circumference (MUAC)	Normal (>22 cm)	55	75.3	18	24.7
	Malnutrition (≤22 cm)	0	0	0	0

Table 2 presents the distribution of waist circumference and mid-upper arm circumference (MUAC) of the farmers in relation to their hydration status. Among male farmers, 70% with normal waist circumference (<94 cm) were hydrated while 30% were dehydrated. In the moderate waist circumference category (94–102 cm), 66.67% were hydrated and 33.33% were dehydrated. All males with high waist circumference (>102 cm) were found to be hydrated, with no cases of dehydration reported in this category. Among female farmers, 80% with normal waist circumference (<80 cm) were hydrated and 20% were dehydrated. In the moderate category (80–88 cm), 87.5% were hydrated and 12.5%

were dehydrated, whereas in the high waist circumference category (>88 cm), 75% were hydrated and 25% were dehydrated.

With regard to mid-upper arm circumference, all participants had MUAC values within the normal range (>22 cm), and none were classified under malnutrition (≤22 cm). Among these farmers, 75.3% were hydrated and 24.7% were dehydrated. Overall, the findings indicate that most farmers had normal MUAC values and a majority were adequately hydrated, although dehydration was observed across different waist circumference categories.

Table 3: Classification of Hydration Status Based on Urine Specific Gravity among Farmers.

Hydration Status	Urine Specific Gravity	Frequency (n)	Percentage (%)	P value
Hydrated	≤ 1.020	55	75.34	
Dehydrated	> 1.020	18	24.66	0.047*
Total		73	100	

Table 3 present the distribution of hydration status among farmers based on urine specific gravity. Urine specific gravity values ≤1.020 were considered indicative of adequate hydration, while values >1.020 were classified as dehydration. The results show that 75.34% of the farmers were adequately hydrated with a mean urine specific gravity of 1.015, whereas 24.66% were found to be dehydrated with a mean value of 1.028.

A previous study conducted by Ta-Chin Wang et al. (2023) reported a dehydration prevalence of 36% among farmers. Compared to this finding, the present study observed a lower prevalence of dehydration (24.7%) among the study population. This variation may be attributed to differences in environmental conditions, work practices, hydration habits, and demographic characteristics of the study populations.

Table 4: Association Between Hydration Practices, Dietary Habits, and Dehydration Status Among Farmers.

Variable	Category	Hydrated n (%)	Dehydrated n (%)	p-value
Daily Water Intake	<1 litre	0 (0.0)	5 (100.0)	<0.001*
	1–2 litres	4 (36.4)	7 (63.6)	
	2–3 litres	12 (66.7)	6 (33.3)	
	>3 litres	39 (100.0)	0 (0.0)	
Frequency of Water Intake While Working	Every hour	18 (100.0)	0 (0.0)	0.002*
	Every 2–3 hours	8 (61.5)	5 (38.5)	
	When thirsty	27 (75.0)	9 (25.0)	
	Rarely	2 (33.3)	4 (66.7)	
Coffee/Tea Consumption	1 time/day	10 (83.3)	2 (16.7)	0.111
	2–3 times/day	26 (76.5)	8 (23.5)	
	>3 times/day	8 (53.3)	7 (46.7)	
	Rarely	11 (91.7)	1 (8.3)	

High Salt Food Consumption	Never	12 (85.7)	2 (14.3)	
	Rarely	19 (95.0)	1 (5.0)	
	Sometimes	14 (66.7)	7 (33.3)	
	Often	10 (55.6)	8 (44.4)	0.014*

Table 4 presents the association between daily water intake, type of fluids consumed during work, and the frequency of water intake with the hydration status of farmers. The results indicate a significant relationship between water consumption patterns and dehydration. All farmers who consumed less than 1 litre of water per day were found to be dehydrated (100%). In contrast, farmers who consumed more than 3 litres of water per day were completely hydrated (100%). Among those consuming 2–3 litres of water daily, 66.7% were hydrated while 33.3% were dehydrated. Similarly, among farmers consuming 1–2 litres of water per day, 36.4% were hydrated and 63.6% were dehydrated. The association between daily water intake and hydration status was found to be statistically significant ($p < 0.001$). These findings are consistent with the study conducted by Stephen A. Mears (2015), which reported that individuals with inadequate water intake were more likely to experience dehydration.

The table also shows the type of fluids consumed while working in the fields. Among farmers who consumed

caffeinated beverages, 68.1% were hydrated and 31.9% were dehydrated. Among those who consumed milk and milk products, 88.9% were hydrated and 11.1% were dehydrated. Similarly, 87.5% of farmers consuming sugary drinks were hydrated while 12.5% were dehydrated.

Furthermore, the frequency of water intake during work showed a significant association with hydration status ($p = 0.002$). Farmers who consumed water every hour were completely hydrated (100%). Among those who drank water every 2–3 hours, 61.5% were hydrated and 38.5% were dehydrated. In contrast, 66.67% of farmers who rarely consumed water during work were dehydrated. Among farmers who drank water only when they felt thirsty, 75% were hydrated while 25% were dehydrated. These findings support the study conducted by Awwalina et al. (2022), which reported that individuals with poor drinking water habits are at a greater risk of dehydration. Overall, the results highlight that adequate and frequent water intake plays a crucial role in preventing dehydration among farmers.

Table 5: Effect of Nutrition Education on Knowledge of Hydration and Healthy Eating Practices among Farmers (Pre-test vs Post-test).

Knowledge Assessment	Pre- Test	Percentage	Post- Test	Percentage
What is dehydration	25	34.2	68	93.2
Select the common causes of dehydration	9	12.3	56	76.7
Select foods rich in water content	17	23.3	56	76.7
What is the symptom of dehydration	11	15.1	54	74
What are the ways to prevent dehydration	9	12.3	52	71.2
What is well balanced diet	4	5.5	62	84.9
How many food groups are there in food pyramid	4	5.5	42	57.5
Select the essential nutrient for the body	6	8.2	62	84.9
Select a food that is rich in protein	18	24.7	64	87.7
Which vitamin is important for eye health	6	8.2	43	58.9
Comparison of knowledge scores				
Score	Mean	N	SD	p value
Pre	1.64	73	1.183	<0.001*
Post	7.66	73	1.530	

Table 5 presents the comparison of knowledge scores related to dehydration, hydration practices, and healthy eating habits among farmers before and after the nutrition education intervention. The results demonstrate a substantial improvement in knowledge following the educational program. Prior to the intervention,

knowledge levels were relatively low across most topics. For example, only 34.2% of farmers correctly understood the concept of dehydration in the pre-test, which increased to 93.2% in the post-test. Similarly, awareness of common causes of dehydration increased from 12.3% to 76.7%, while knowledge of foods rich in water content

improved from 23.3% to 76.7%. Understanding of dehydration symptoms increased from 15.1% to 74%, and knowledge regarding preventive measures improved from 12.3% to 71.2% after the intervention.

Knowledge related to nutrition also showed notable improvement. Awareness of a well-balanced diet increased from 5.5% in the pre-test to 84.9% in the post-test. Knowledge about the number of food groups in the food pyramid increased from 5.5% to 57.5%, while awareness of essential nutrients improved from 8.2% to 84.9%. Similarly, knowledge about protein-rich foods increased from 24.7% to 87.7%, and awareness of the vitamin important for eye health improved from 8.2% to 58.9%.

The overall comparison of knowledge scores showed a significant increase from a mean score of 1.64 ± 1.183 in the pre-test to 7.66 ± 1.530 in the post-test. The difference was found to be **statistically significant** ($p < 0.001$), indicating that the nutrition education program was highly effective in improving farmers' knowledge regarding hydration and healthy dietary practices.

These findings are consistent with previous studies. A study conducted by David Garcia-Garcia *et al.* (2022) reported that nutrition education interventions significantly improved participants' awareness and practices related to hydration and dietary habits. Similarly, research by Dongxu Wang *et al.* (2013) emphasized that educational programs focusing on nutrition and health can substantially enhance knowledge and promote healthier lifestyle choices. The results of the present study therefore support the effectiveness of structured nutrition education programs in improving knowledge and awareness among farmers, which may ultimately contribute to better hydration practices and improved health outcomes.

CONCLUSION

The present study highlights that dehydration remains an important occupational health concern among farmers who work under hot environmental conditions and perform strenuous physical labour. The findings revealed that 24.7% of the farmers were dehydrated based on urine specific gravity measurements, indicating that a considerable proportion of the farming population is at risk of inadequate hydration. The study also identified several factors associated with dehydration, including low daily water intake, infrequent water consumption during work, high consumption of caffeinated beverages and salty foods, and limited hydration practices while working in the field. Among these, inadequate water intake showed a statistically significant association with dehydration, emphasizing the importance of maintaining adequate fluid consumption during farm activities.

The results further demonstrated that nutrition education interventions can play a significant role in improving awareness and knowledge regarding hydration and

healthy dietary practices. After the educational program, farmers showed a marked improvement in their understanding of dehydration, its causes, symptoms, prevention strategies, and the importance of balanced nutrition. The significant increase in mean knowledge scores from the pre-test to the post-test confirms the effectiveness of the intervention in enhancing health-related knowledge among the participants.

Overall, the study underscores the need for targeted health promotion and nutrition education programs for farmers, particularly in rural and agricultural communities where occupational exposure to heat and physical exertion is high. Promoting regular water intake, encouraging frequent hydration during work, improving access to clean drinking water in agricultural fields, and increasing awareness about balanced diets can help reduce the risk of dehydration and improve the overall health and productivity of farmers. Future research with larger sample sizes and broader geographic coverage is recommended to further understand dehydration risks among agricultural workers and to develop effective community-based interventions for prevention.

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