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Impact of an Educational Workshop on Dietitians' and Dietetics Students' Self-Efficacy, Knowledge, and Assessment Skills in Fluid and Electrolyte Management

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ABSTRACT

Hydration plays a crucial role in maintaining health and physiological functions, yet dehydration contributes to morbidity in chronic diseases. Despite the importance of hydration management, research indicates that healthcare professionals, including dietitians, lack sufficient training and confidence in this area. This study aimed to assess the impact of an educational workshop on dietitians' and dietetic students' self-efficacy, knowledge, and assessment skills related to hydration and electrolyte management. A non-randomized, pre-post observational study was conducted among 191 dietitians and dietetic students attending a half-day continuing education program in Ghana. Participants completed pre- and post-surveys assessing self-efficacy, knowledge, and assessment skills. The Wilcoxon signed-rank test was used to evaluate changes in scores. Data were analyzed using IBM SPSS Statistics Version 29, with significance set at $p < 0.05$. Out of 191 participants, 141 completed both pre- and post-surveys. Significant improvements were observed in self-efficacy (hydration: $Z = 8.64$, $p < 0.001$; electrolytes: $Z = 8.66$, $p < 0.001$), assessment skills ($Z = 7.57$, $p < 0.001$), and knowledge ($Z = 7.45$, $p < 0.001$). Both dietitians and students showed similar improvements across all variables. The workshop significantly enhanced participants' confidence, knowledge, and assessment skills in hydration and electrolyte management, addressing critical gaps in their professional training. The findings underscore the need for ongoing, interprofessional education in hydration care. Targeted educational interventions can effectively improve healthcare professionals' abilities to manage hydration, with implications for better patient care outcomes. Further research is needed to expand these findings across diverse settings.

Key words: *Hydration Management; Electrolyte Management; Self Efficacy; Continuing Education*

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INTRODUCTION

Adequate hydration is an essential component of overall health, influencing numerous physiological functions and playing a vital role in maintaining homeostasis. There is evidence that proper hydration status is associated with several health benefits including a lower risk of kidney stones and urinary tract infections, a reduction in hypertension, coronary heart disease, thromboembolism and improved glycaemic control (Popkin et al, 2010, El-Sharkawy et al, 2015). Dehydration on the other hand affects health, performance and well-being as well as contributes to morbidity in several chronic disease processes (Liska et al, 2019). Fluid losses of between 1% and 4% can lead to progressive reductions in athletic performance, appetite and thermoregulation and delirium may develop in the elderly and very ill (Liska et al, 2019). Adverse effects on kidney function and the cardiovascular system function may also begin to develop (El-Sharkawy et al, 2015). Death may ensue with fluid losses in excess of 8% (Byard & Riches, 2005). The known benefits of adequate fluid or hydration status notwithstanding, Garcia-Garcia (2022) have reported that few studies have focused on hydration in hospitals and care homes and recommended that nursing and healthcare support staff should undergo appropriate training to improve their knowledge on hydration. Liska et al. (2019) identified several key gaps in knowledge among health professionals regarding hydration issues including a lack of awareness of the recommended hydration guidelines, a lack of understanding about the broader impact of hydration on various health outcomes and lack of training to accurately assess hydration status in patients. Jéquier and Constant (2010) have also reported that health professionals and nutritionists are often confused about hydration matters and wonder about issues such as, how best to determine hydration status, how much individuals should drink and the need to drink fluids regularly. Healthcare professionals (HCPs), particularly dietitians are strategically placed to advise and educate on the benefits of proper hydration and the best ways to achieve this (Holdsworth 2012). However, McCotter et al (2016) in their work among general practitioners (GPs) noted that, hydration issues beyond hospital-based learning are not very well detailed in general practice curricula, and that there is a paucity of research assessing GP knowledge or confidence in providing hydration advice to key population groups in primary care. This observation is likely to be the case for most health care professions including dietitians.

Undergraduate research (unpublished) carried out at the University of Ghana among dietitians revealed that some of the barriers to providing optimum care to patients were, poor communication between medical doctors and dietitians in relation to hydration issues, lack of training in assessing hydration status of patients and lack of training in how to provide optimum hydration care to patients (Andoh, 2018). This study further emphasized the need for training in assessing and addressing hydration issues as part of curricula and Continuous Professional Development (CPD) sessions for registered dietitians, students and students (Andoh, 2018). Thus, the aim of this study was to assess the impact of an educational workshop on dietitians' and dietetics students' self-efficacy, knowledge and assessment skills in fluid and electrolyte management among patients.

METHODS

Study Population

A non-randomized, pre-post observational study was conducted with dietitians and dietetic students in Ghana attending a continuing education program on hydration and electrolyte management of patients. The primary objectives were to evaluate the impact of an educational workshop on participants: 1) self-efficacy managing hydration and electrolyte status among patients 2) knowledge of hydration and electrolyte management, and 3) hydration and electrolyte assessment skills. Participants were dietitians and dietetics students residing in Ghana who participated in a half-day continuing education program. Convenience sampling was utilized.

Data Collection

Intervention. The continuing education program was advertised via email, websites and social media to dietitians and dietetic students in Ghana. The program was half a day and presented synchronously to an in-person and live, online audience. The continuing education program was led by an advanced-level dietitian and dietetics professor. Topics covered during the program included water function and fluid homeostasis, thirst mechanism, fluid requirements across the lifecycle and with varying disease conditions, calculation of fluid balance, dehydration assessment and treatment, fluid accumulation assessment and treatment, electrolyte derangement and treatment. Multiple case studies were utilized to improve knowledge acquisition and

skill development. The program was interactive and allowed time for questions and answers.

Tools. To evaluate hydration and electrolyte management self-efficacy, knowledge and assessment skills, participants completed a pre- and post-survey on Qualtrics prior to the program start and immediately upon conclusion of the program. Self-efficacy was assessed by a 2-item questionnaire on participants' confidence managing patients' hydration and electrolyte status. A 4-point Likert scale was used for each question and ranged from "not at all confident (0 points)," to "somewhat confident (1 point)," to "mostly confident (2 points)," to "very confident (3 points)" for a total score range of 0 – 24.

Hydration assessment skills were assessed by 6 questions. Participants were asked to list areas of the body to assess hydration status during a nutrition-focused physical exam, laboratory values that can be altered by fluid imbalance, clinical symptoms of dehydration, and techniques for physically assessing pitting edema, pulmonary edema, and ascites. A composite hydration assessment skill was scored by the principal investigator who is an advanced practice dietitian. Each criterion was worth one point for a total possible score ranging from 0 to 6.

Knowledge of hydration and electrolyte management was assessed by 6 questions. Participants were asked to match electrolyte imbalance with likely causes, select the most appropriate intervention for a patient with dehydration and electrolyte imbalance, and calculate fluid balance on a case study patient. A composite knowledge score was also scored by the principal investigator. Each criterion was worth one point for a total possible score ranging from 0 to 6.

Data Analysis

To determine the effectiveness of the continuing education program on participants' self-efficacy, assessment skills and knowledge, pre- and post-scores for each variable were compared. The Wilcoxon signed rank test was used to determine if differences in the paired scores was significant. The data were analyzed using IBM SPSS Statistics Version 29. All statistical tests were performed at the significance level of .05.

Ethical Considerations

The study was approved by the University of Ghana School of Biomedical and Allied Health Sciences Ethics Committee (SBAHS-ND/10518370/SA/2017-2018).

RESULTS

Forty-eight percent of participants were dietitians and 52% were dietetic students. Among the dietitians, 40% have been in practice 1-3 years, 20% have been in practice 3-5 years, 20% have been in practice 5-10 years, and 20% have been in practice 10+ years.

To test for normality, a Kolmogorov-Smirnov test was conducted on all variables. The Kolmogorov-Smirnov test was chosen because n $\geq$50. The p-values for all variables were <0.001 so there was significant evidence to reject the null hypothesis that the variables follow a normal distribution.

Self-efficacy, knowledge, and assessment skills for all participants. To explore differences in self-efficacy, knowledge, and assessment skills in participants prior to the program and after the program, Wilcoxon signed rank tests were conducted for each variable. The means, standard deviations, median, interquartile range, and p-value pre- and post-test are shown in Table 1. All participants had a significant improvement in self-efficacy managing hydration, n=141, Z = 8.64, p <0.001, and self-efficacy managing electrolytes, n=141, Z = 8.66, p <0.001. Assessment skills significantly improved for all participants, n=141, Z = 7.57, p <0.001. Finally, all participants had a significant improvement in knowledge, n=141, Z = 7.45, p <0.001.

Self-efficacy, knowledge, and assessment skills dietitians versus dietetic students. We further analyzed the results to see if there were differences in program impact between dietitians and dietetic students. The means, standard deviations, median, interquartile range, and p-value pre- and post-test are shown in Table 1. Self-efficacy managing hydration and self-efficacy managing electrolytes improved in both dietitians, n=67, hydration Z = 5.61, p <0.001 and n=67, electrolyte Z = 5.88, p <0.001, and dietetic students, n=74, hydration Z = 6.61, p <0.001 and electrolyte Z = 6.39, p <0.001. The gain in assessment skills was highly significant for both dietitians, n=67, Z = 5.28, p<0.001 and dietetic students, n=74, Z = 5.43, p<0.001. The total knowledge score also significantly improved in both dietitians, n=67, Z = 5.41, p <0.001 and dietetic students, n=74, Z = 5.18, p <0.001.

Table 1. All participants self-efficacy, knowledge and assessment skills pre and post

All Dietitians and Dietetic Students (n=141)					
	Pretest		Posttest		
	Mean + SD	Median (interquartile range:	Mean + SD	Median (interquartile range:	Sig.
Hydration Self-Efficacy	2.16 ± 0.71	2 (1)	2.89± 0.68	3 (0)	<.001
Electrolyte Self-Efficacy	1.98 ± 0.78	2 (2)	2.73 ± 0.65	3 (1)	<.001
Assessment Skills	4.87 ± 2.84	5 (3)	7.06 ± 1.12	5 (3)	<.001
Knowledge	1.41 ± 1.23	1 (2)	2.45 ± 1.11	2 (1)	<.001
Dietitians Only (n=67)					
	Pretest		Posttest		
Hydration Self-Efficacy	2.28 ± 0.74	2 (1)	3.01 ± 0.64	3 (0)	<.001
Electrolyte Self-Efficacy	2.16 ± 0.79	2 (1)	2.93 ± 0.56	3 (0)	<.001
Assessment Skills	4.99 ± 2.79	5 (3)	7.13 ± 1.46	7 (2)	<.001
Knowledge	1.45 ± 1.22	2 (2)	2.49 ± 1.21	2 (1)	<.001
Dietetic Students Only (n=74)					
	Pretest		Posttest		
Hydration Self-Efficacy	2.04 ± 0.67	2 (0)	2.78 ± 0.71	3 (1)	<.001
Electrolyte Self-Efficacy	1.81± 0.73	2 (1)	2.54 ± 0.67	3 (1)	<.001
Assessment Skills	4.81 ± 2.95	6 (3)	6.99 ± 1.39	7 (2)	<.001
Knowledge	1.38 ± 1.24	1 (2)	2.42 ± 1.02	2 (1)	<.001

DISCUSSION

The findings of this study highlight the significant impact that a targeted educational workshop can have on the self-efficacy, knowledge, and assessment skills of dietitians and dietetic students regarding hydration and electrolyte management. Given the essential role of adequate hydration in maintaining physiological functions and preventing morbidity, it is critical that healthcare professionals, particularly dietitians, are well-equipped to manage hydration and electrolyte status in patients. The improvements observed across all measured outcomes—self-efficacy, knowledge, and assessment skills—underscore the effectiveness of the workshop in addressing these needs.

The enhanced knowledge and skills gained through this targeted educational workshop have the potential to translate directly into improved patient outcomes. With increased confidence and self-efficacy, dietitians are more likely to make informed and timely decisions regarding hydration and electrolyte management, which is essential for maintaining homeostasis and preventing complications such as dehydration, electrolyte imbalances, or even kidney-related issues. Improved assessment skills equip dietitians with the practical tools needed to detect early signs of hydration issues, allowing for quicker interventions that may prevent more severe outcomes. When healthcare professionals are better equipped, the quality of care

improves, ultimately reducing the risk of morbidity and improving overall patient health.

One of the key insights from this study is that practitioners, including dietitians, often lack confidence in managing hydration and electrolyte status, a gap that the workshop effectively addressed. This finding is consistent with previous research that has pointed to a general uncertainty among health professionals regarding hydration matters (Jéquier & Constant, 2010, Liska et al, 2019). Another research reported dietitians showing knowledge of physical signs of hydration however, lacked knowledge on other important matters related to hydration such as recommended water intakes and water content of foods and drinks (Douglas et al., 2015). By improving self-efficacy, the workshop not only enhanced the participants' ability to manage hydration and electrolyte imbalances but also likely increased their overall confidence in clinical decision-making related to these critical areas.

The significant gains in assessment skills are particularly noteworthy, as they emphasize the importance of developing practical competencies in hydration management. While laboratory tests can provide valuable data, they alone cannot diagnose dehydration, making the ability to assess hydration status through clinical skills indispensable. This aligns with the assertion by Andoh (2018) that training in hydration assessment should be an integral part of dietetics education and continuous professional development.

While the workshop resulted in immediate gains, assessing the long-term sustainability of these improvements is crucial. One method for ensuring that knowledge, self-efficacy, and practical skills are retained is to integrate periodic follow-ups, refresher courses, or continuous professional development (CPD) programs. Research suggests that while short-term gains from educational interventions can be substantial, knowledge and confidence may wane over time if not reinforced (Salas et al., 2012). Longitudinal studies would be useful to evaluate whether the gains observed in this workshop are maintained over months or years, as well as to identify any specific areas where retention may be weak. Regular reassessments of participants' knowledge and self-efficacy would also help in refining educational programs for sustained impact.

However, the study is not without limitations. One of the primary limitations is the potential lack of generalizability of the findings. The participants were drawn from a specific group attending a single workshop, and while the results are promising, they may not necessarily apply to all dietitians and dietetic students, particularly those in different geographical regions or practice settings. Additionally, the study did not capture the participants' years of practice, which could have provided valuable insights into how experience levels might influence the effectiveness of the workshop.

Looking forward, the results of this study suggest several avenues for future application and research. First, there is a clear need for more extensive and ongoing training that is interprofessional in nature. Given the multidisciplinary nature of patient care, ensuring that all healthcare professionals, not just dietitians, have a solid understanding of hydration and electrolyte management could improve patient outcomes. Future workshops should therefore consider including other health professionals, such as nurses and physicians, to foster a more collaborative approach to hydration care.

Moreover, future research should explore the readiness to learn among healthcare professionals in relation to hydration and electrolyte management. Understanding the factors that influence readiness to learn could help in designing more effective educational interventions that are tailored to the specific needs and learning styles of different practitioners. This could, in turn, enhance the overall impact of such programs and ensure that they meet the needs of the healthcare community.

RECOMMENDATIONS

Based on the results of this study, several recommendations are appropriate. o sustain the gains made during this workshop, it is recommended that similar educational programs be integrated into the standard continuous professional development frameworks for dietitians and other healthcare professionals. Ongoing opportunities for learning and skills assessment should be made available to ensure long-term retention of hydration management competencies. Given the multidisciplinary nature of patient care, a second recommendation is that hydration and electrolyte management should be a collaborative effort across healthcare professions. Future workshops and training sessions should adopt an interprofessional approach, including dietitians, nurses, and physicians, to ensure all team members

are aligned in managing hydration and electrolyte issues. Additionally, Incorporating digital tools such as mobile apps, telehealth platforms, or simulation-based learning can help practitioners apply their newfound knowledge in real-time clinical scenarios. These tools can act as continuous learning aids, ensuring that professionals have ongoing access to current best practices in hydration management. A final recommendation is that institutions should consider implementing systems that routinely monitor hydration-related patient outcomes as a way of tracking the effectiveness of professional training. By directly linking educational interventions with patient outcomes, healthcare providers can assess the real-world impact of improved hydration and electrolyte management skills.

CONCLUSION

This study provides strong evidence that targeted continuing education can significantly improve dietitians' and dietetic students' confidence, knowledge, and skills in managing hydration and electrolyte status. While the findings are promising, further research is needed to explore their generalizability and to identify additional strategies for enhancing the education and training of healthcare professionals in this critical area.

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