

THE FREQUENCY OF HYPOKALEMIA IN PATIENTS WITH NASOGASTRIC FEEDING IN NON-HOSPITAL SETTINGS

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ABSTRACT

Objectives: To determine the frequency of hypokalemia in patients on nasogastric feeding with homemade blends and juices in non-hospitalized settings.

Material and Methods: The cross-sectional study was carried out in the General Medicine Department of Khyber Teaching Hospital, Peshawar from 1st January 2016 to 30th June 2016. There was a total of 176 patients in our study. We enrolled patients with oropharyngeal or esophageal dysphagia who were sent home on nasogastric tube feeding with homemade blends and juices. They were followed up after two weeks in the outpatient department, and their blood samples were collected for checking their serum potassium levels. Samples were tested using K-lite 5 series electrolyte analyzer at Khyber Teaching Hospital laboratory for the presence of hypokalemia.

Results: There were 98 males and 78 females in the study population. The mean age was 58.15 years \pm 13.35 SD. The mean value of potassium was 4.07 mmol/L \pm 0.8 SD. In our study sample, we found hypokalemia in 31 (17.6 %) of the patients sent on nasogastric feeding at home.

Conclusion: Hypokalemia among patients with oropharyngeal and esophageal dysphagia who are on nasogastric tube feeding with homemade juices and liquefied blends for two weeks or more in a non-clinical setting was a relatively common finding irrespective of age, gender, or underlying disease. It is essential to recognize as it can be life-threatening.

Keywords: Hypokalemia, Nasogastric tube, Feeding.

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INTRODUCTION

Nasogastric (NG) tube feeding is a relatively common practice and is mainly used for patients with swallowing problems, particularly in the geriatric population. This procedure is relatively safe, and nasogastric tube feeding is used widely to support nutritional requirements in patients with an intact and functional gastrointestinal tract. Moreover, it is economical, relatively non-invasive, and easily manageable by healthcare workers compared to other enteral feeding options like PEG tubes and Jejunostomy. However, it can cause complications, including aspiration pneumonia, local trauma, diarrhea, and metabolic abnormalities.¹ Metabolic abnormalities associated with nasogastric tube feeding are quite common, and various studies have demonstrated its prevalence.² Hyperglycemia has been a well-documented abnormality associated

with nasogastric tube feeding.³

Electrolyte imbalances can be life-threatening and can lead to fatal cardiac arrhythmias, neuromuscular disease, and myelinolysis of the pons if not recognized and managed promptly.^{4,5} Nasogastric tube feeding can cause GI irritation, vomiting, and diarrhea, and patients are predisposed to fluid and electrolytes disturbances. Hyponatremia, hypophosphatemia, hyperkalemia, and hypomagnesemia are associated with enteral tube feeding.^{6,7} In our setup, there are limitations for options like jejunostomy tube and PEG tube feeding. Patients admitted in hospital with a stroke, swallowing disorders, and conditions that can impair consciousness remain on nasogastric tube feeding for long durations. This can predispose patients to electrolyte derangements, especially potassium, as it is present in high concentration in gastrointestinal secretions.⁸ Hypokalemia is a possible complication and can be catastrophic as it can cause ventricular arrhythmias and neuromuscular weakness, leading to increased morbidity and mortality.^{4,5}

It is usual practice to discharge patients home with nasogastric tube in situ and follow them up in the outpatient department for reassessment. There is no local study on the prevalence of hypokalemia in patients discharged home on nasogastric tube feeding using homemade juic-

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es and liquefied blends. Our study aimed to determine the frequency of hypokalemia in patients on NG tube feeding at home, which can help us formulate a protocol for identifying and managing hypokalemia promptly if prevalent in our setup and possible supplementation with potassium at home for its prevention.

MATERIAL AND METHODS

This descriptive, cross-sectional study was conducted in the Medicine department of Khyber Teaching Hospital, Peshawar. The study duration was six months, and it was conducted from 1st January 2016 to 30th June 2016. We started our study after obtaining approval from the institutional ethical committee. All Patients who had unsafe swallowing secondary to a cerebrovascular accident or were unable to take food secondary to dementia or esophageal dysphagia admitted to the medical unit were considered for this study. All patients with oropharyngeal or esophageal dysphagia were sent home on exclusive NG tube feeding with homemade juices and liquefied blends for 2 weeks. Patients having normal electrolytes on the day of discharge of either gender and age above 18 years were included in the study.

Patients with chronic kidney, chronic liver disease, patients on diuretics, ACE inhibitors, or Angiotensin receptor blockers, those with two episodes of diarrhea or vomiting on a single day in the last one week and in those who had abdominal surgery or a history of intestinal obstruction in the previous four weeks were excluded. A serum level of potassium less than 3.6 mmol/liter was labelled as hypokalemia. The feed included homemade blended/liquefied recipes.

Clinical assessment was done by taking history and detailed clinical examination. The procedure of blood phlebotomy was explained to participants before collecting samples. The blood sample was collected using a 5cc BD syringe with a 23 gauge. Patients were advised not to make a fist while collecting the sample.⁹ We did not apply tourniquet for identifying veins. If needed, it was applied for less than a minute and removed immediately after determining needle in the vein during venipuncture.

A 3-milliliter blood sample was collected and transferred immediately in an evacuated blood collection tube containing heparin for proper serum collection¹⁰ Plunger of the syringe was not pushed while transferring samples to tubes to avoid hemolysis for avoiding effects on extracellular potassium levels.¹¹

Tubes were gently inverted a few times for proper mixing with heparin and immediately transferred to the laboratory. Every sample was analyzed within four hours at Khyber teaching hospital laboratory by a pathologist with

a minimum of 5-year experience. Serum was analyzed for potassium levels using K-lite 5 series electrolyte analyzer.

Data was analyzed using SPSS-23. Chi-square test was applied after stratification of data to check any significant association of hypokalemia with gender and different age groups. A P-value of less than or equal to 0.05 was considered significant. Results are presented in the form of tables.

RESULTS

In this study, we observed 176 patients sent home on nasogastric feeding with homemade juices and liquefied blends, in which 98 (55.6%) were male, and 78 (44.4%) were female patients. The male to female ratio was 1.22:1. The average age was 58.15 years ± 13.35 SD, and patients were stratified into four groups according to age, as given in Table 1. Average Serum Potassium was 4.07 mmol/L ± 0.82 SD. (Table 1)

Hypokalemia in patients on nasogastric feeding was found in 31 (17.6%) patients, while 145 (82.4%) patients had normal potassium levels (Figure 1). Distribution of hypokalemia (serum potassium < 3.6 mmol/L) according to the age of patients on nasogastric feeding shows that old age patients were more prone than younger age but statistically insignificant difference when stratifying over various age groups.

Hypokalemia was found in one-fifth of the patients in the age range above 76-years which was 6 (20.6%), followed by 21 patients (18.1%) having 50-75 years of age. The finding was comparatively low in younger age groups with 3(13%) in the age range of 25-50 years and 1 (1.25%) in 18-25 years (table 2). Gender-wise presence of hypokalemia was almost equal with 14 (17.9%) of females demonstrating the abnormality compared to males

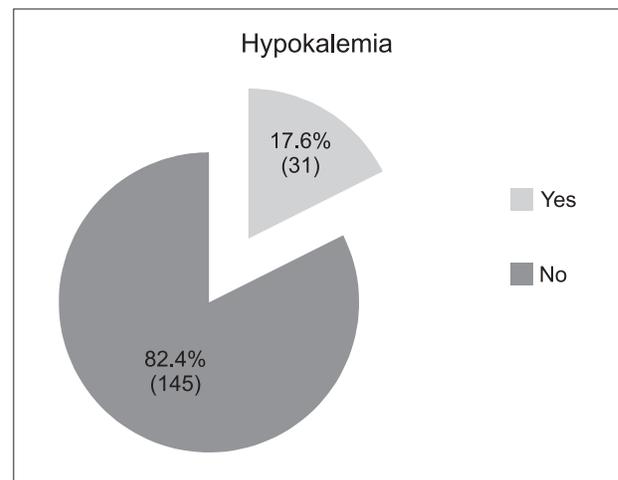


Fig 1: Hypokalemia distribution in the patients

Table 1: Age-wise stratification of the patients & mean values

Age in Years	Frequency	Percent
18 - 25	8	4.5
26 - 50	23	13
51 - 75	116	66
76 -100	29	16.5
Total	176	100.0
Age (Mean +SD)	58.15 years ± 13.35	
Serum Potassium (Mean ± SD)	4.07 mmol/L ± 0.82 SD	

Table 2: Age-wise distribution of Hypokalemia

		Hypokalemia		Total	p-value
		Yes	No		
age (in years)	18-25	1	7	8	0.6835
		1.25%	98.75%	100.0%	
	26-50	3	20	23	
		13%	87%	100.0%	
	51-75	21	95	116	
		18.1%	81.9%	100.0%	
	76-100	6	23	29	
		20.6%	79.4%	100.0%	
Total		31	145	176	
		17.6%	82.4	100.0%	

Table 3: Gender wise distribution of Hypokalemia

		Hypokalemia		Total	p-value
		Yes	No		
Gender	Male	17	81	98	0.917
		17.3%	82.7%	100.0%	
	Female	14	64	78	
		17.9%	82.1%	100.0%	
Total		31	145	176	
		17.6%	82.4%	100.0%	

Table 3: Distribution of Hypokalemia in different disease groups

Indication for NG tube	Hypokalemia		Total	p-value
	Yes	No		
Cerebrovascular accident	17	90	107	0.751
	(15.8%)	(84.2%)	(100%)	
Dementia with oropharyngeal dysphagia including parkinsons	7	24	31	
	(22.5%)	(77.5%)	(100%)	
Oesophagal dysphagia including malignancy	5	18	23	
	(21.5%)	(78.5%)	(100%)	
Others	2	13	15	
	(13.3%)	(86.7%)	(100%)	
Total	31	145	176	
	(17.6%)	(82.4%)	(100%)	

17 (17.3%) Moreover, there was no significant difference in the distribution of hypokalemia among different diseases groups (table 3 and 4).

DISCUSSION

Hypokalemia is a complicated metabolic disorder and is well documented in patients on enteral feeding admitted to the hospital. Our main aim was to check the frequency of this electrolyte abnormality in patients sent home on nasogastric tube feeding. Our study showed that hypokalemia was present in 31(17.6%) of the study population after having two weeks of exclusive nasogastric tube feeding with homemade juices and liquefied blends at home. The finding of hypokalemia was not statistically significantly different among different age groups, gender, or different disease groups.

Pancorbo – Hidalgo, and colleagues did a study to see complications associated with NG tube feeding in the Internal medicine unit. They reported hypokalemia in 20.2 percent of the study population. It was relatively higher than our findings as it was performed in hospitalized patients. A study conducted in the Republic of Korea reported hypokalemia common in both elderly and non-elderly who had nasogastric tube feeding.¹² Sam Vanlandingham and his team evaluated patients on enteral tube feeding for metabolic abnormalities, and they found hypokalemia (8%), hyperkalemia (40%), and hyperglycemia (29%) in their study participants. Almost half of the study population in this study had a history of admission to ICU, which could probably explain such a high percentage of hyperkalemia.²

Oh HyanSoo and colleagues looked at the effect of feeding iso-osmolar formula via NG feeding in patients who had an acute stroke and demonstrated no significant effect on serum sodium and potassium level and attributed hyperglycemia to the stress effect of acute thrombotic event.¹³ Enteral tube feeding with iso-osmolar formula did not significantly affect sodium and potassium levels. However, most participants had hyperglycemia before and after enteral tube feeding, indicating that hyperglycemia can be attributed to stress response related to acute brain infarction regardless of tube feeding. Another study showed metabolic complications in 2 percent of the study population on enteral tube feeding, and a majority had hyperkalemia rather than hypokalemia.¹⁴ Metabolic abnormalities, including potassium imbalances, have also been reported in patients on long-term enteral nutrition at a nursing home on nasogastric tubes and PEG tubes feeding.^{15, 16}

There have been inconsistent potassium level ab-

normalities in patients on nasogastric tube feeding, as evident from the above studies. Reasons could be a difference in participants, nature of their disease, feeding formulas used, and types of intravenous fluids therapy administered. Furthermore, GI intolerance is commonly associated with nasogastric tube feeding, which can lead to an increase in potassium losses in GI secretions and may have resulted in inconsistent potassium levels in different studies.¹⁷ Our study population was different as they were followed up after having feeding at home. We excluded patients who had more than two episodes of diarrhea or vomiting on the same day. Lastly, comorbidities like chronic kidney disease and medications used by patients can affect the results of potassium levels and can lead to varying results.

We excluded confounders like medications, chronic kidney disease, and medications that could affect potassium levels for getting accurate results, but our study still had several limitations. We advised patients about diet plans at home. Still, compliance with that can't be assured because of the lack of community-based follow-up.^{18, 19} Secondly, we mainly focused on potassium levels. It would have been better to assess for other metabolic abnormalities like glucose, sodium, magnesium, and phosphorous to have an overall view of metabolic abnormalities. Thirdly sample size was small because of time restraints that could limit results generalization to our population.

Studies can be done to check metabolic complications in addition to hypokalemia associated with enteral tube feeding at home. Such studies can provide a broader picture of various electrolytes and metabolites trends related to NG tube feeding. A larger study population on a standardized enteral feeding can provide further evidence on the association between hypokalemia and Nasogastric tube feeding.

We recommend educating patients and their caregivers about NG tube feeding because of the extensive range of biochemical problems and complications associated with enteral feeding. Moreover, a nutritional plan, type of nutritional supplements, and community services will help in identifying and preventing complications like hypokalemia related to nasogastric tube feeding at home.^{18, 19, 20}

CONCLUSION

Hypokalemia among patients on nasogastric feeding in non-clinical setting is relatively common and essential to recognize as it can be life-threatening.

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AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under

Khan B: Concept/ Idea, Literature, review, Drafting & Final Review

Naeem A: Concept/ Idea, Analysis & Interpretation of Data, References

Naim F: Manuscript Writing, Literature review, Analysis & Interpretation of Data

Ullah K: Concept/idea, Data Collection

Wazir ZM: Concept/idea, Literature review, Drafting & Final Review

Khan N: Concept/idea, Literature review

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.