Clinical Profile of Patients with Dry Beriberi Attending at Chittagong Medical College Hospital

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Abstract

Background: Dry beriberi is a manifestation of thiamine (Vitamin B1) deficiency that primarily affects the peripheral nervous system. It can occur independently or with other forms of beriberi, such as Wernick's encephalopathy, Korsakoff Psychosis, wet beriberi etc. To describe the socio-demographic profile of dry beriberi patients and the common clinical patterns of dry beriberi presentation.

Materials and methods: This descriptive observational study was conducted among adult patients with possible dry beriberi admitted into the Neurology Department of Chittagong Medical College Hospital (CMCH) from May 2018 to November 2018. A total of 55 patients were recruited by consecutive sampling method. Data collected by structured questionnaire was analyzed for descriptive statistics by using SPSS Version 23.

Results: The mean age of the subjects was 31.1±12.0 years (18-65 years). There was female predominance with a male-to-female ratio of 1:2.3. About half of them had educational qualifications below SSC level and lived in rural areas. Majority (58.2%) of them had a monthly family income of 10,000-20,000 taka. All patients consumed polished rice 'Atop'. All of them was hed rice > 3 times before cooking and none of the patients was purely vegetarian. Among 55 patients, 50 (92%) patients consumed tea, 12(21.8%) persons ate betel nuts immediately after the major meal and 2(1.1%) ate fermented fish occasionally as part of their typical diet. The mean BMI was 24.2 ± 3.1 SD. Many of them (67.3%) had clinical evidence of anaemia. The most common presenting symptoms were limb weakness (100%). Other presenting features were leg swelling (98.2%), sensory impairment (Pain, tingling and numbness in limb) (90.9%) anorexia and nausea (50.9) muscle cramps (30.9%) etc.

Conclusion: Dry beriberi is a neglected but serious condition that can lead to significant neurological impairment if left untreated. Prompt recognition and appropriate management with thiamine supplementation are crucial for preventing long-term complications.

Key words: Dry Beriberi; Neuritic Beriberi; Peripheral Neuropathy; Thiamine deficiency.

Introduction

Beriberi was common during 1800 and early 1900 in Southeast Asia. Its appearance corresponded with the invention of roller mills, which made it possible to produce white rice at a cost that people with limited resources could afford.[1,2] Wheat flour and polished rice are two examples of milled white cereals that are extremely low in thiamine. Recent reports of thiamine deficiency outbreaks have come from Ivory Coast jails, Gambia, Somalia, Taiwan and Brazil where the food rations provided were unbalanced in calorie, protein and micronutrient contents.[3-7]

Thiamine deficiency-related disorders with unbalanced thiamine/ thiaminasediets were also recently reported in Cambodia, China, Thailand, Laos and various countries.[8,9,10,11] Additionally, Japanese youths who consume polished rice, instant noodles, and carbonated soft drinks with high sugar content have been reported to experience cardiac failure linked to thiamine deficiency.[12] In the last 20 years, there have been more and more reports of thiamine deficiency-related illnesses from Kashmir, ranging from exclusive cardiac dysfunction to neurological disorders.[13]

In Bangladesh, there are no exact statistics regarding the prevalence of beriberi, although it is thought to be prevalent in the southern area of Chattogram division i.e. Satkania, Lohagara, Banshkhali, Anowara, Chandanaish, Cox's Bazar, Moheshkhali, Kutubdia, Teknaf etc. It is an

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observation of our day-to-day clinical practice but why it is common in this region is a matter of interest. In a poor country like Bangladesh, it is not always possible to document beriberi with biochemical evidence. Based on our observations, patients with suspected thiamine deficiency responded favourably to thiamine therapy trials. It serves as indirect proof that the disease persists.There are, however, no studies that address this issue holistically. This circumstance inspired us to design this research project to evaluate these patients' clinical and epidemiological characteristics.

Materials and methods

This descriptive cross-sectional study was carried out in the Neurology Ward of CMCH from May 2018 to November 2019. Fifty-five (55) patients were recruited by convenience sampling.

Informed written consent had been obtained from the patients after a full explanation of the outcome and purpose of the study. Detailed clinical information was recorded in a pre-designed Case Record Form (CRF). SPSS (Windows version 23.0) was used for data processing and analysis. Continuous data were reported as the means ± SD or median and interquartile range. Qualitative or categorical data were described as frequencies and proportions.

Adults (Age>18 years) participants are included by the following criteria: Risk factors + at least 2 of the following signs:

a) Muscle weakness of upper and or lower limb (Less than grade 5 power in MRC scale).

b) Positive sensory symptoms (Burning, tingling or pain).

c) Objective sensory deficit (Pain, touch, position, vibration sense).

d) Absent or reduced deep tendon reflexes.

e) Positive squat test (Unable to rise after squatting without help).

f) Leg swelling.

Risk factors included an Imbalanced diet (Diet poor in thiamine/rich in carbohydrate or anti-thiamine factors) malnutrition, alcoholism, GIT surgery, chronic diarrhoea, chronic vomiting, pregnancy or history of recent delivery, chronic. diuretics use, dialysis, total parenteral nutrition.

Patients with isolated cardiac/wet beriberi and patients with known causes of peripheral neuropathy such as Diabetic, hereditary, Demyelinating (GBS, CIDP) metabolic (Hepatic/renal impairment), drugs (e.g. INH, Ethambutol, Phenytoin, Metronidazole, Dapsone etc.) Toxin (As, OPC, Pb, Hg except alcohol) etc were excluded from the study.

The CMCH Ethical Review Committee approved this study.

Results

The mean age of the subjects was 31.1±12.0 years (18-65 years). There was female predominance with a male-to-female ratio of 1:2.3. In males highest representation was from age group ≥41 years in contrast to 21-30 years age group in females. Female patients were younger than male patients (Mean age 37.5±17.4 years and 28.5±7.8 years respectively in male and female (Table I). Most of the female subjects (94.7%) were housewives and most of the male subjects (35.3%) were farmers. Majority (70%) of them had a monthly family income below 20,000 taka, about half of them (54.5%) lived in the rural areaand 76% had educational qualifications below SSC level (Table II). Dietary habits showed, 100% consuming milled/polished rice. All of them washed their rice > 3 times before cooking and only 3.6% of them discarded excess water after cooking rice. None of the patients followed a strictly vegetarian diet. Among 55 patients, 50 (92%) patients consumed tea, within 5 minutes of a meal ranging from 3 to 5 times,12(21.8%) persons ate betel nuts immediately after a major meal, or 2(1.1%) ate fermented fish occasionally as part of their typical diet (Table III).Considering risk factors, 40.0% of the patients had imbalanced diet (Carbohydrate-rich diet) consumption. About one-third (34.5%) had a history of delivery within last 1 month (Table IV).

The most common presenting symptom of the patients was limb weakness (100%). It was present in lower limbs alone in 39 patients or both upper and lower limbs in 16 patients. Majority of them had leg swelling (98.2%) and sensory impairment (Pain, tingling, and numbness in limb) (90.9%) (Figure 1). The mean BMI was 24.2 ± 3.1 SD. Most of them (67.3%) had clinical evidence of anemia (Table V).

Table I Age and sex distribution of the patients (n=55)

Age, in years	Male	Female	Total	p value
<20 years	4 (25.0%)	9 (23.1%)	13 (23.6%)	
21-30 years	4 (25.0%)	15 (38.5%)	19 (34.5%)	0.057*
31-40 years	3 (18.5%)	13 (33.3%)	16 (29.1%)	
41 years	5 (31.5%)	2 (5.1%)	7 (12.7%)	
Total	16 (29.1%)	39 (70.9%)	55 (100%)	
Mean ±SD	37.5±17.4	28.5±7.8	31.1±12.0	0.010†
Range	19-65	18-50	18-65	

*Chi-square test, †Unpaired t test.

Table II Distribution of the social characteristics of the patients (n=55)

Characteristics		Frequency (Percentage)
Religion		
Marital status	Unmarried	10 (18.2%)
	Married	45 (81.8%)
Residence	Urban	13 (23.6%)
	Semi-urban	12 (21.8%)
	Rural	30 (54.5%)
Education	Primary or below	13 (23.6%)
	SSC or below	28 (50.9%)
	HSC and above	14 (25.5%)
Monthly family	<10,000	7 (12.7%)
income, BDT	10,000-20,000	32 (58.2%)
	20,000-30,000	13 (23.6%)
	>30,000	3 (5.5%)

Table III Dietary habits of the subjects (n=55)

Dietary habit	Frequency (Percentage)
Use of polished rice	55 (100%)
Washing rice > 3 times before cooking	55 (100%)
Discard excess water after cooking	2 (3.6%)
Pure vegetarians	0 (0%)
Regular tea Consumption	50(92%)
Regular Intake of betel nut	12(21.8%)
Habitual use of fermented/raw fish	2(1.1%)

Table IV Associated risk factors among the patients (n=55)

Risk factors	Frequency (Percentage)
Imbalanced diet	22 (40.0%)
H/O delivery within last 1 month	19 (34.5%)
Pregnancy	5 (9.1%)
Alcohol use	3 (5.5%)
Chronic vomiting	2 (3.6%)
Psychiatric illness	2 (3.6%)
Chronic diarrhoea	1 (1.8%)
Hemodialysis	1 (1.8%)

Table V BMI and clinical evidence of anaemia in the patients

Variables		Frequency (Percentage)
BMI, Kg/m^2	18.50-22.99	21 (38.2%)
	23.00-24.99	12 (21.8%)
	25.00	22 (40.0%)
Anaemia	Absent	18 (32.7%)
	Present	37 (67.3%)

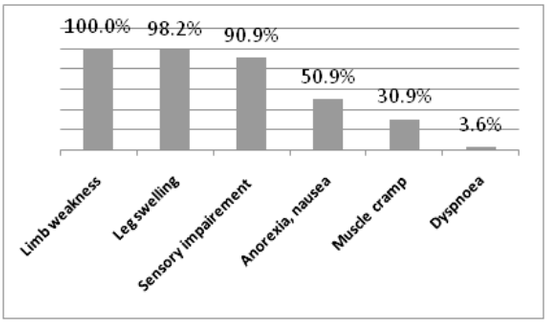

Figure 1 Presenting symptoms of the patients (n=55)

Discussion

In our study population, there was female predominance and it was evident that most females belonged to the reproductive age group. The disease was precipitated by pregnancy or childbirth. In our social culture, females usually eat the leftover food of males and consume thiamine-depleted cereals to meet their energy needs. As a result,they have a lower thiamine to calorie ratio than men. A hospital-based study done in Kashmir found that thiamine deficiency-related neuropathy may be common in females, especially in the peripartum period in the Kashmiri community.[14] In contrast, a study in Gambia by Tang et al. showed that the attack rate was highest in young males who are involved in heavy physical work.[4] Their diet was carbohydrate-predominant and heavy physical exertion increased thiamine requirements and depleted the body's limited storage of thiamine.

Atop rice or milled and polished unboiled rice, was the primary food ingested by all patients. Consuming excessive amounts of carbs increases the need for thiamine. Polished rice diets are heavy in carbs, which increases the need for thiamine and is exacerbated by low thiamine contents.[1] All of them washed rice > 3 times before cooking. As Thiamine is water soluble, washing rice and discarding cooking water causes most of the vitamin to be lost.[1]

However, in our study, only 3.6% of subjects discarded excess water after cooking rice as during cooking "Atop" rice, discarding water is not a common practice in this part of the country. According to an MSF/Epicentre 15 study on the eating habits of nursing mothers in the Karen Refugee population with suspected thiamine deficiency, polished rice was frequently washed up more than three times before boiling and a significant amount of the cooking water was discarded depleting the amount of thiamine in the grain. Further more, the majority of women chewed betel nut, which has an anti-thiamine element, immediately after eating. In addition, they consume raw fermented fish paste, which is high in thiaminase and serves as the primary component of the sauce that is consumed with rice. A similar type of result was shown in McGready et al.[10] An extensive nutrition survey to find outbreaks of beriberi in Bhutanese refugees in Nepal by Save the Children Fund (UK) (1994) also highlighted food contents and above food habits (Except fermented fish intake which is not a common eating practice in Bhutan). Pregnancy, alcohol use, fever, chronic disability, exercise, diabetes, and dysentery were among the risk factors for thiamine deficiency that Rolfe and colleagues identified in the Gambia. In the present study, about one-third (34.5%) had a history of delivery within the last 1 month (NVD 7, LSCS 10). Five (5) patients were pregnant inthe last /3rd trimester. In another study on the Karen displaced population in Thailand 6 out of 18 pregnant females were deficient biochemically in thiamine at term.[10] We know that pregnancy and lactation are both conditions associated with increased physiological demand for many micronutrients including Thiamine. Other causes include nausea, vomiting related to pregnancy and poor oral intake. Although alcohol is an important risk factor, in the present study only 3 (5.5%) alcoholic subjects were found (2 are tribal and 1 is native). Alcohol intake is uncommon in our study as it is forbidden by both religion and social culture. Moreover, 3.6% of subjects suffered chronic vomiting (PUD) 3.6% suffered chronic psychiatric illness leading to avoidance of food, 1.8% of subjects had chronic diarrhoea (IBS) and 1.8% had haemodialysis due to post-diarrhoeal AKI. In 40.0% of subjects,an imbalanced diet (Predominant carbohydrate diet) is the risk factor.

Nutritional status was measured by BMI. As per BMI category for the Asian population, 21 (38.2%) had normal BMI, 12 (21.8%) patients were overweight and 22 (40.0%) patients were obese. None of the respondents was underweight (<18.5) which was in contrast to the study by Kow-Tong Ghen et al. where BMI was negatively associated with the outbreak among Chinese immigrants in a detention center in Taiwan.[6] The mean BMI of their study was 21.5 whereas that of ours is 24.23. The reason for the raised BMI in our study was that we had included pregnant women and women in the peri-partum period. Most of our patients (67.3%) had clinical evidence of anaemia but it was not further classified as micro, macro or normocytic. In another study by Ahmed et al. involving peripartum women of Kashmir, among 23 patients 2 had microcytic and 3 had dual deficiency type.[13]

The most common presenting symptom of the patients was limb weakness (100%). Weakness was more in frequently used muscles i.e. limb muscles. It was present in lower limbs alone in 39 patients andin both upper and lower limbs in 16 patients. The majority of them had leg swelling (98.2%) and sensory impairment (90.9%). Leg swelling occurred without cardiac involvement in 52 patients. Sensory impairment is more in the form of tinglingand burning sensation (83.5%) rather than in the negative form (Loss of pain, touch, temperature, position vibration) (16.36%). GIT features of beriberi (Anorexia, nausea) were present in more than half of patients (50.9%). Muscle cramp was present in 30.9%. Only 2 patients (3.6 %)had associated dyspnea as a part of cardiac involvement which improved after IV thiamine cardiac function became normal when echocardiography was done after 2 days.A similar presentation is seen in several studies and case reports in India, Japan and Tunisia.[13,16-19] In our study, 48 patients (87.27%) had objective evidence of mixed sensory-motor impairment, 7(12.72%) had motor deficits without sensory complaints but no patient presented with sensory features alone. A study in Indiafound mixed sensory-motor features in 18(75%) patients, pure motor in 5(21%) and pure sensory in only 1(4%) patients.[16]

Limitations

The small sample size and lack of biochemical evidence of thiamine deficiency are the limitations of our investigation. The erythrocyte transketolase activity- thiamine pyrophosphate effect test is a costly test and has not been done in our country.

Conclusion

Dry beriberi is a serious condition that can lead to significant neurological impairment if left untreated. Prompt recognition and appropriate management with thiamine supplementation are crucial for preventing long-term complications.

Recommendation

Large-scale study is needed to highlight this common but neglected problem and to aware the government of the situation as well as to formulate strategies to prevent thiamine deficiency.

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Contributions of authors

NM- Conception, study design, data acquisition, manuscript writing & final approval.

PM-Dataacquisition, Interpretation & final approval.

MMAK-Interpretation of data, critical revision & final approval.

SAMM- Interpretation of data, critical revision & final approval

MAS-Interpretation of data, critical revision & final approval.

MH-Study design, Interpretation of data, critical revision & final approval.

Disclosure

All the authors declared no conflict of interest.

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