



Outbreak of Tongue Lesions among Students of a Central School in Chhukha, Bhutan and the role of Vitamin B Complex Tablets in the Treatment of Atrophic Glossitis - A Retrospective Descriptive Study

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ABSTRACT

Background: There were two outbreaks of tongue lesions in the year 2020 among boarder students in Paksikha Central School, Chhukha, Bhutan. The same school had similar outbreak in 2018 and 2019 academic session. The patients had improved on treatment with vitamin B complex tablets after clinical diagnosis during recent outbreak. Therefore, the current study was conducted for scientific dissemination of evidence for intervention.

Methods: The students who had tongue lesions were treated at the school during the first visit and records were maintained. The same record was used for follow up of the outcome of treatment after fifteen days. The new students who became ill during the second outbreak were treated and followed up after fifteen days. Records of 97 patients were used in the study.

Results: The most common tongue lesion was atrophic glossitis with 23 (62.2%) and 44 (73.3%) patients in the first and second outbreak respectively. More than 60% of the patients were females in both the outbreaks and there was no death. The students who were residing in the hostel for longer months had more in proportion in atrophic glossitis patients with 25 (67.6%) and 32 (72.7%) in the first and second outbreak respectively. More than 80% with atrophic glossitis recovered after treatment with Vitamin B complex tablet.

Conclusion: All the students who had the tongue lesions were boarders and more than 80% of students had recovered after 15 days of treatment with vitamin B complex tablets. The role of Riboflavin (vitamin B2) which is present in vitamin B complex tablet but missing in fortified rice that is served to students in boarding schools may further be explored.

Keywords: Bhutan, Glossitis, Students, Tongue Lesions

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1. Background

There were two outbreaks of tongue lesions at Paksikha Central School under Bongo gewog, Chhukha District, Bhutan in the year 2020. The first outbreak of tongue lesions among students was reported to hospital authority on 30 September, 2020 and similar second outbreak in the same school which was reported on 15 October, 2020. There were 619 students during time of outbreak with 584 students staying as boarders in hostel (1). This school is located at a distance of about 130 kilometres from the capital city of Thimphu and about 10 kilometres from the Gedu hospital. Meals for students of central schools in the country are provided through hostel. The dry food commodities like fortified rice, dal, chick pea, sugar, milk powder, tea leaf, processed cheese, salt are centrally purchased by the education ministry and supplied by Food Corporation of Bhutan while vegetables, fruits and dairy products are purchased by the school administration (2). The school reopened in July 2020 for classes ten and twelve and external visitors and homemade food was not allowed. The students of classes nine and eleven joined the school on September 19 in compliance to the prevailing COVID 19 prevention protocol in the school (3). The same school had similar outbreaks in the years 2018 and 2019 (4). There were reports of outbreak of tongue lesions among students of some central schools in Bhutan during mid of academic session in the years 2018, 2019 and it was mainly seen among boarder students (4). It has been taken as the issue of concern both by the health and education ministries(5). There were deaths of a few students in boarding schools because of peripheral neuropathy which was caused by deficiency of thiamine (Vitamin B1) in body(6). This finding of Thiamine deficiency had contributed evidence for introduction and supply of fortified rice in the central schools since 2018 to improve nutrition content of food (7).. However, due to some unidentified reasons then started the problem of tongue lesions among students in the schools as per reports at the Ministry of Education, Bhutan. This study was therefore conducted to assess causes for tongue lesions among the students, identify response to treatment and provide evidence for prevention or management of similar outbreak in future.

2. Methods

The study was a retrospective descriptive analysis of medical records of students who were treated for tongue lesion during outbreak in the school. The treatment for students from the school and follow up on response to treatment was provided by Gedu hospital. The hospital team comprising of medical officer, dentist and pharmacy technician visited the school on 15 October and examined and treated the students who reported to have tongue lesions. The team collected demographic details including age, sex, class and dietary preferences whether taking meat or egg. The medical officer examined the students and recorded types of tongue lesions. The pharmacy technician issued medicines which were prescribed by the medical officer according to clinical findings of the lesions. The school reported second outbreak on October 15, and health authorities visited the school on 16 October, 2020. The team followed up the patients who were treated on September 30, 2020. The team then examined the new group of students with the tongue lesions and collected demographic details including age, sex, class, and dietary preferences whether taking meat or egg. The students who were examined on 16 October 2020 were examined 15 days later.

The treatment used for atrophic glossitis was tablet Vitamin B complex, 32.5 mg one tablet two times per day for fifteen days. Tablet paracetamol 500 mg was given for three days if patient had pain. Advice was given on oral hygiene, to avoid hot and spicy food if the patients felt hurt on the tongue while taking meals. The patients were identified as cured if they tell in history that the pain on tongue was reduced, pain during swallowing of food reduced; redness and excessive salivation was improved. The clinical signs included reduced redness of tongue, reduced size of ulcer and there was no added infection on the tongue. The treatment given for Benign Migratory Glossitis (BMG) was nystatin paste to apply locally on the tongue every six hours, tablet paracetamol if there was pain and vitamin C tablets for one 15 days. The patients with fissured tongue were given assurance and treatment was given to alley the symptoms of pain. The students were also advised on importance of maintaining good oral hygiene irrespective of the type of lesion.

There were 37 students who were ill with lesions on their tongue during the first outbreak and 60 new students who were ill during the second outbreak. The students who were treated on 30th September 2020 were followed up on 16th October and those treated on 16th October were followed on 31 October. All the 97 records of these patients who were treated were used in the study.

Prior ethical approval was obtained from the Research Ethics Board of Health (REBH), Bhutan (REBH/Approval/2021/035) dated 3rd March, 2021.

2.1. Study Variables

Study variables included types of tongue lesions in males and females, number of patients with each type of lesions, number of students with each types lesions from classes nine to twelve, dietary preferences such as whether eating meat or egg and outcome such as recovered or improving after fifteen days of treatment. Classes nine and eleven were grouped in one while classes ten and twelve were grouped in other.

2.2. Data Entry and Analysis

The details of students were recorded during health team's visit to school and then kept with medical officer for further follow up. Data was extracted from the details recorded during patients' treatment and follow up. The data were then entered in Epi Data and analysed in Epi Data Analysis 2.2.2.182 version. The variables were described in counts and proportions.

3. Results

There were 37 students who had tongue lesion during the first outbreak and among them 23 (62.2%) were females. All the students were boarders. The most common tongue lesion was atrophic glossitis with 26 (70.3%) students and among them 18 (69.2%) were females. There were 3 (8.1%) students suffering from BMG and 8 (21.6%) students had fissured tongue. There were 25 (67.6%) students from class 10 and 12 who had atrophic glossitis. Twenty one (80.8%) students who had atrophic glossitis had recovered when followed after 15 days of treatment and others were improving as per history and clinical examination (Table 1).

Table 1. Tongue lesions by age, lesions types, class and treatment outcome in the patients during first outbreak of tongue lesions among students of a central school in Chhukha, Bhutan

Lesions by age (n=37)	Age range in years	Mean age	Standard Deviation
Atrophic Glossitis	15 - 20	18.04	1.28
Benign Migratory Glossitis	17-18	17.6	0.58
Fissured Tongue	17-19	17.9	0.64
Lesions by Clinical findings (n=37)	Males n (%)	Females n (%)	Total n (%)
Atrophic Glossitis	8 (30.8)	18 (69.2)	26 (100)
Benign Migratory Glossitis	1 (33.3)	2 (66.7)	3 (100)
Fissured Tongue	5 (62.5)	3 (37.5)	8 (100)
Atrophic Glossitis by classes (n=26)	Males n (%)	Females n (%)	Total n (%)
Class Nine and Eleven	1 (0)	0 (0)	1 (100)
Class Ten and Twelve	7 (28.0)	18 (72.0)	25 (100)
Benign Migratory Glossitis by class (n=3)	Males n (%)	Females n (%)	Total n (%)
Class Nine and Eleven	0 (0)	0 (0)	0 (0)
Class Ten and Twelve	1 (33.0)	2 (67.0)	3 (100)
Fissured Tongue by class (n=8)	Males n (%)	Females n (%)	Total n (%)
Class Nine and Eleven	1 (100)	0 (0)	1 (100)
Class Ten and Twelve	4 (57.1)	3 (42.9)	7 (100)
Outcome after 15 days of treatment (n=37)	Recovered n (%)	Improving n (%)	Total n (%)
Atrophic glossitis	21 (80.8)	5 (19.2)	26 (100)
BMG	2 (66.7)	1 (33.3)	3 (100)
Fissured Tongue	6 (75.0)	2 (25.0)	8 (100)

Nineteen patients (73.0%) of atrophic glossitis said they eat egg and 21(80.8%) said they eat meat when provided in hostel (Table 2).

Table 2. Tongue lesions by types and dietary preferences in the patients during first outbreak of tongue lesions among students of a central school in Chhukha, Bhutan

Disease with dietary Preferences (n=37)	Eats Egg n(%)	Eats meat n (%)	Does not Eat Egg n (%)	Does not Eat meat n (%)
Atrophic glossitis	19 (73.1)	21 (80.1)	7 (26.9)	5 (19.2)
BMG	2 (66.0)	2(67.0)	1 (33.0)	1 (33.0)
Fissured tongue	6 (75.0)	6 (75.0)	2 (25.0)	2 (25.0)

There were 60 students who had tongue lesion during the second outbreak and among them 41 (68.3%) were females. All the students were boarders. The most common tongue lesion was atrophic glossitis with 44 (73.3%) students and among them 31 (70.5%) were females. There were 10 (16.7%) students suffering from Benign Migratory Glossitis and 6 (10%) students had fissured tongue. There were 32 (72.7%) students from class 10 and 12 who had

atrophic glossitis. Thirty six (81.8%) students who had atrophic glossitis had recovered when followed after 15 days of treatment and others were improving as per history and clinical examination. There was no death in both the outbreaks (Table 3).

Lesions by age (n=60)	Age range in years	Mean age	Std Deviation
Atrophic Glossitis	14 - 21	17.85	1.83
Benign Migratory Glossitis	15-20	18.4	1.43
Fissured Tongue	16-19	17.5	1.43
Lesions by Clinical findings (n=60)	Males n (%)	Females n (%)	Total n (%)
Atrophic Glossitis	13(29.5)	31 (70.5)	44 (100)
Benign Migratory Glossitis	4 (40.0)	6 (60.0)	10 (100)
Fissured Tongue	2 (33.3)	4 (66.7)	6 (100)
Atrophic Glossitis by class (n=44)	Males n (%)	Females n (%)	Total n (%)
Class Nine and Eleven	2 (16.7)	10 (83.3)	12 (100)
Class Ten and Twelve	11 (34.4)	21 (65.6)	32 (100)
Benign Migratory Glossitis by Class (n=10)	Males n (%)	Females n (%)	Total n (%)
Class Nine and Eleven	0	2 (100)	2 (100)
Class Ten and Twelve	4 (50.0)	4 (50.0)	8 (100)
Fissured Tongue by class	Males n (%)	Females n (%)	Total n (%)
Class Nine	1 (100)	0 (0)	1 (100)
Class Ten and Twelve	1(20.0)	4 (80.0)	5 (100)
Outcome after 15 days of treatment (n=60)	Recovered n (%)	Improving n (%)	Total n (%)
Atrophic Glossitis	36 (81.8)	8 (18.2)	44 (100)
Benign Migratory Glossitis	7 (70.0)	3 (30.0)	10 (100)
Fissured Tongue	5 (83.3)	1 (16.7)	6 (100)

Thirty nine (80.6%) of patients of atrophic glossitis said they eat egg and 38 (86.3%) said they eat meat when provided in hostel (Table 4).

Table 4. Tongue lesions by types and dietary preferences in the patients during second outbreak of tongue lesions among students of a central school in Chhukha, Bhutan

Disease with dietary Preferences (n=60)	Eats Egg n (%)	Eats meat n (%)	Does not Eat Egg n (%)	Does not Eat meat n(%)
Atrophic Glossitis	39 (88.6)	38 (86.4)	5 (11.4)	6 (13.6)
Benign Migratory Glossitis	6 (60.0)	6 (60.0)	4 (40.0)	4 (40.0)
Fissured tongue	6 (100)	6 (100)	0 (00.0)	0 (00.0)

4. Discussion

Our study found that atrophic glossitis was the most common tongue lesion followed by Benign Migratory Glossitis (BMG) and fissured tongue. Glossitis or inflammation of tongue is characterized by redness, altered sensation, inability to take food, excessive salivation etc(8). It can be of two types; Atrophic Glossitis (AG) and Benign Migratory Glossitis (BMG). Atrophic glossitis is characterized by the partial or complete absence of filiform papillae on the dorsal surface of the tongue(8). It may be caused by deficiencies of some major nutrients including riboflavin, niacin, pyridoxine, vitamin B12, folic acid, iron, zinc, and vitamin E. Moreover, protein-calorie malnutrition, candidiasis, *Helicobacter pylori* colonization, xerostomia, and diabetes mellitus are also the etiologies of AG(8-11). Benign Migratory Glossitis or erythema migrans which is an inflammatory condition characterized by focal areas of bald

tongue with surrounding redness or scaling, resulting in a “map-like” appearance of the tongue(12). Fissured tongue is characterized by deep grooves and discoloration may occur with inflammation(13).

These lesions were found only in the boarding students of the school and the number of female students who had suffered the tongue lesions were more than the male students. The students of class ten and twelve who had reported to school early (1st July) were more in number than the students of classes nine and eleven who reported to school later (19th September). The students who reported to school early were residing in the hostel for longer duration than those who reported later because students were not allowed to move out of school campus due to need for observing COVID 19 protocol in the school.

There were outbreaks in the past but the reports were inconclusive due to which definitive intervention could not be done as evidenced by repeated outbreaks for the last three years(14). Also, there is no evidence whether the atrophic glossitis incidences have any link with food fortification because the investigations from the samples collected from some of the schools did not show any link with the outbreak(14). However, we found that more than 80% of the students suffering from atrophic glossitis had improved when treated with Vitamin B complex tablets for fifteen days. The only difference we observed between the fortified rice and Vitamin B complex tablet is the presence of 2 milligrams Riboflavin (Vitamin B2) in each tablet of the vitamin B complex; the fortified rice has Vitamin B1, B3, B6, B9, B12, Vit A, Iron and Zinc but there is no Vitamin B2(15). In fact, when a deficiency of riboflavin does occur, it is almost invariably in association with multiple nutrient deficits but this may have been prevented by consumption of fortified rice supplied in the hostel. Also, the food intake recall assessment by the nutritionists of Ministries of health and education found that the students were getting only 0.2 mg of Riboflavin (B2) through food per day but the Recommended Daily Allowance (RDA) of Riboflavin in adolescents (age 10 to 18 years) is 0.9 to 1.3 mg and in adults (19 to 70 years) it is 0.9 to 1.1 mg and deficiency is more prominent in girls because of increased metabolic demand(16). In the past investigations the Riboflavin (Vitamin B2) content in the body of the students suffering from glossitis was not tested(4,14). The main dietary sources of riboflavin are meat and dairy products; only small amounts are found in grains and seeds. Leafy green vegetables are also a fairly good source of riboflavin and in developing countries tend to be the main source of the vitamin. However, the definite causes of such illness remain poorly characterized, largely due to limited diagnostic and microbiological facilities at district hospitals like Gedu(17).

More than 80% of students with Atrophic Glossitis had recovered after treatment with Vitamin B complex tablets for fifteen days and others were improving. The treatment of atrophic glossitis with a vitamin B complex tablet two times daily had provided 4 mg of vitamin B2 per day as each tablet contains 2 mg of Vitamin B2 (18). This treatment had contributed to improvement in the atrophic Glossitis symptoms and signs because one of indications of use of vitamin B complex is treatment and prophylaxis of riboflavin deficiency (19). Among the students with atrophic glossitis more than 70% had taken meat or egg that was served in the school. However, the quantity of meat or egg served to the students may not have been enough to meet the required intake to prevent the atrophic glossitis because Riboflavin deficiency is likely to be more prevalent among those who take less quantity of animal source foods.

This study has the following strengths. First, it is only study which discusses about vitamin B2 in the context of atrophic glossitis outbreak in the central schools in Bhutan. Second, the authors adhered to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines in conducting the study.

This study has certain limitations as being a record based study with small records of patients. Though there were more of proportions of females among the patients we did not study to find the cause. Further, we did not study whether the same students were suffering for the three consecutive years or there were new students each year and this remains as a gap in our study.

5. Conclusion

All students who developed the tongue lesions were boarders and those who were in the hostel for longer duration were more in number among the sick students. The treatment with vitamin B complex tablets was effective as more than 80% of students had recovered after 15 days of treatment. The role of Riboflavin (vitamin B2) which is present in vitamin B complex tablet that is used in the treatment but missing in fortified rice that is served to students in boarding schools may further be explored. Therefore, a prospective study with larger sample size and micronutrient analysis may be needed to identify the causes of glossitis outbreak among the students in central schools.

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REFERENCES

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1. Paksikha Central School. Annual School Statistics. Chhukha; 2020.
 2. School Health and Nutrition Division. Personal Communication. Thimphu; 2020.

3. Principal S. Personal communication with the school authority. Chhukha; 2020.
4. School Health and Nutrition Program, Ministry of Education B. Report on the investigation of Glossitis outbreak in schools. 2019.
5. Department of Public Health, Ministry of Health B. Executive order. In: MoH/DoPh/HPD/CSHP/11/2019-2020/395. 2019.
6. Laigden Dzed, Tandin Dorji, Dorji Pelzom, Guru P. Dhakal, Pemba Yangchen KW. Status of Thiamin deficiency in boarding school children from seven districts in Bhutan with previous history of peripheral neuropathy outbreaks: a cohort study. *Bhutan Heal J* [Internet]. [cited 2020 Feb 15];1(1):49–56. Available from: <http://www.bhj.com.bt/index.php/bhj/article/view/8/7>
7. Forest M of A and. Rice Fortification. Information and Communication Technology Division (ICTD) Ministry of Agriculture and Forests. 2018 Aug;1 to 4.
8. Chiang C-P, Yu-Fong Chang J, Wang Y-P, Wu Y-H, Wu Y-C, Sun A. Atrophic glossitis: Etiology, serum autoantibodies, anemia, hematinic deficiencies, hyperhomocysteinemia, and management. *J Formos Med Assoc* [Internet]. 2019 [cited 2020 Feb 18]; Available from: <http://creativecommons.org/licenses/by-nc-nd/4.0/>
9. Evaluating the public health significance of micronutrient malnutrition.
10. Mitmesser SH. Riboflavin. In: *Sports Nutrition: Vitamins and Trace Elements, Second Edition*. CRC Press; 2005. p. 61–8.
11. Ashoori M, Saedisomeolia A. Riboflavin (vitamin B 2) and oxidative stress: a review. 2020 [cited 2020 Feb 18]; Available from: <https://doi.org/10.1017/S0007114514000178>
12. Stoopler ET, France K, Ojeda D, Sollecito TP. Visual Diagnosis in Emergency Medicine BENIGN MIGRATORY GLOSSITIS. *J Emerg Med* [Internet]. 2018 [cited 2020 Feb 18];54:e9–10. Available from: <https://doi.org/10.1016/j.jemermed.2017.09.035>
13. Reamy B V, Derby R, Col L, Bunt CW. Common Tongue Conditions in Primary Care [Internet]. Vol. 81. 2010 [cited 2021 Mar 16]. Available from: www.aafp.org/afpAmericanFamilyPhysician627
14. Nutrition Program, Ministry of Health, Thimpohu B. Report of outbreak investigation on Oral Sores (Glossitis) among the Students of two Central Schools, Tsirang Dzongkhag, Bhutan, Sept 2018. Thimphu; 2018.
15. Dzed L. Personal communication. In: Meeting with Secretary of Ministry of Education and Director of Ministry of Health. 2020.
16. Buehler BA. Vitamin B2: Riboflavin [Internet]. Vol. 16, *Journal of Evidence-Based Complementary and Alternative Medicine*. StatPearls Publishing; 2011 [cited 2021 Mar 17]. p. 88–90. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK525977/>
17. Laboratory Unit GH. Laboratory Report.
18. Gracure Pharmaceuticals Ltd. Vitamin B Compound Tablets. India: Ministry of Health, Bhutan; 2019.
19. Health M of. National Essential Medicine Formullary. 8th ed. Thimphu: Ministry of Health, Bhutan; 2016. 127 p.