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Keywords: grass pea, consumption, neurolathyrism.

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Grass Pea Consumption and Present Scenario of Neurolathyrism in the South Central Coastal Area of Bangladesh

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Abstract- Grass pea can be consumed as supplementary nutrients in a diet without a neurolathyrism health problem among all classes of people in the south-central coastal area of Bangladesh. The study aimed at assessing the grass pea consumption pattern in diet and detection of neurolathyrism patients over 400 respondents among four villages. An investigation was also done on various paralytic admitted patients at hospital in the south central coastal region of Bangladesh. Among respondents of four villages 63% were male, 38.75% was illiterate, 41.5% was completed primary education and 30% of respondent's monthly income Tk.6000-9500 was maximum. Among respondents 89.6% consumed grass pea was 1/3 or less than cereal at its proportion in a meal and they all consumed meat, fish, egg, vegetables also. In grass pea food items 25.25% respondents prefer Dal barta was maximum and Dobakhesari (snack) 0.75% was lowest. 95.75% respondent was used various spices like onion, garlic, chili, tamarind etc. with grass pea to making food items to increasing its palatability and testes. 90 % respondent was consumed grass pea as various items of Dal in their servings five years or more. Neurolathyrism affected paralysis patients was not detected among the respondents of four villages and admitted patients in hospitals. Among the paralysis admitted patients in hospitals 90.4% were higher suffered from stroke and 0.4% was lowest due to the drug (Isoniazid).

Keywords: grass pea, consumption, neurolathyrism.

I. INTRODUCTION

In the south-central coastal region of Bangladesh, most of the respondents have an idea that a chemical contained in grass pea causes a health problem as paralysis and was scared also to consume grass pea. Naturally, grass pea grown in this area contains comparatively low toxin (ODAP) and traditionally used different processing steps like soaking and washing as well as food consumption pattern (blending or mixing with other crops, applying different spices eat with an

antioxidant rich foods etc.) also may be decreased toxin level (ODAP) which may favors to decrease risk of neurolathyrism. Grass pea is probably the most drought tolerant legume crop and it is also resistant to moderate salinity. (Yang, Hui-Min and Zhang, Xiao-Yan, 2005). Grass pea is cultivated and consumed in India, Nepal, and Bangladesh and in many parts of Africa that are prone to recurrent droughts (Stodolak B *et al.*, 2008). It is often considered a life saver crop (Lambein F *et al.*, 2008). The protein content of grass pea seeds is higher compared to other legume seeds (Monsoor M A *et al.*, 2002). Neurolathyrism is a form of human spastic paraparesis is related to the over consumption of the legume *Lathyrussativus* or grass pea caused by neurotoxin β -ODAP (Haque A *et al.*, 1994). This disease is prevalent in some area of Bangladesh, India, Nepal, Ethiopia and effects more men than women (Spencer *et al.*, 1993). Most of the patients develop heavy legs, spasms of the muscles of the legs and spasticity. The risk factors for neurolathyrism are heavy physical activity, male gender, young age (15-25years), and micronutrient deficiency like Zn, Cu, Vitamin C and A (Rao SLN; 2001). Sulfur amino acids deficiency caused by grass pea diet plays an important role in the toxicity of l- β -ODAP by increasing the oxidative stress (Eguchi *et al.*, 2011). Recent research suggests that sulfur amino acids have a protective effect against the toxicity of β -ODAP (Sriram *et al.*, 1998). The mean prevalence of neurolathyrism reaches 6 per 1000 in Ethiopia, 5.3 per 1000 in India and 1.4 per 1000 Bangladesh (IPBO; 2009). At present there is no treatment available for neurolathyrism. Prevention strategies need to be applied in efficiently.

II. MATERIALS & METHODOLOGY

A cross-sectional study was performed at the four villages named Shirampur in Dumki, Imamkathi in Bakhergonj, Barobegay in Patuakhalisador and Goaurichanno in Baroguna sador upazila in the south central coastal area of Bangladesh from January to May, 2013. The geographical location of the site of experiment was at 22° 42' 0" north latitude to 90° 22' 0" east longitude. To estimate the consumption pattern of the grass pea in diet and detection of neurolathyrism patients in each village 50 households and 100

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populations were selected using a quota sampling method based on the highest production and consumption of grass pea in that area. The consumption pattern of the grass pea with diet and detection of neurolathyrisms patient survey was carried out by the food frequency questionnaire over the 400 respondents in 200 households among four villages. The respondent was mostly senior and responsible person of the household. At the same time another investigation was done on various paralytic patients at the medicine department in Shere-e-Bangla medical college and hospital in where major portion of various paralysis patients was admitted from this area. Identification of neurolathyrisms cases by the Snowball sampling method was carried out by observing prescription, register entry book given by a physician

and neurological examination of an individual also in the presence of a doctor. The respondents were in separate households. One set of questionnaire for primary data collection were developed with an emphasis on food consumption pattern, specially grass pea consumption and present status of the physical condition of an individual. One set of the questionnaire was pre-tested and necessary improvement was made. The respondents included primarily to represent some of the key characteristics associated were observed to be directly or indirectly related to the consumption grass pea with various food stuffs, period of consumption of grass pea and the physical condition of respondents. Face to face interview has been carried out following Paper and Pencil (PAPI) method. Database was prepared in Microsoft Excel format separately.

III. RESULTS

a) Socio-economic and demographic profile of the respondents in household

Table 1: Socio-economic and demographic profile of the respondents in household

Characteristics	Imamkathi	Shirampur	Borobegay	Goaurichonno	Mean
Sample Size (N)	100	100	100	100	100
Sex (%)					
male	60	64	62	66	63
female	40	36	38	34	37
Age (years) (%)					
<=20	5	7	4	2	4.5
21-40	28	30	25	22	26.25
41-60	61	55	66	68	62.5
>60	6	8	5	8	6.75
Educational status (%)					
Illiterate	35	38	40	42	38.75
Primary	34	42	46	44	41.5
SSC	15	12	10	8	11.25
HSC	12	6	3	4	6.25
Degree	4	2	1	2	2.25
Monthly income (in taka) %					
No income	6	9	10	5	7.5
1500-2000	5	7	5	10	6.75
2100-4600	12	14	7	12	11.25
4600-6000	20	19	18	15	18
6000-9500	33	24	35	28	30
Above 9500	24	27	25	30	26.5

b) Food habit of the respondents

Among respondents, 94.5% rice and only 5.5 % was consumed wheat as a stable food in these areas.

Grass pea or other food grains was not consumed as stable food in that areas.

Table 2: Stable food consumption rate in the southern central coastal area of Bangladesh

Food grain	Imamkathi	Shirampur	Borobegay	Goaurichonno	Mean
Rice	92	94	95	97	94.5
Wheat	8	6	5	3	5.5
Grass pea	0	0	0	0	0
Others	0	0	0	0	0

c) *Nature of grass pea consumption with food items of respondents in a meal*

A majority respondents 89.6% consumed grass pea in these villages were 1/3 or less than at its

proportion in a meal. No respondents consumed grass pea as solitary and a majority 92% consumed grass pea with various foodstuffs like meat, milk, fish egg, vegetables in their daily meal.

Table 3: Nature of grass pea consumption with food items of respondents in a meal

Characteristics	Imamkathi	Shirampur	Borobegay	Goaurichonno	Mean
How much proportion of grass pea you consumed in a meal?					
Grass pea at all	0	0	0	0	0
With $\geq 1/3$ cereal	95	90	88	85	89.5
With $< 1/3$ cereal	5	10	12	15	10.5
Did you eat meat, milk, fish, egg, vegetables in your diet with grass pea in your meal generally?					
Yes	100	100	100	100	100
No	0	0	0	0	0

d) *Consumption status of various pulses in diet*

Among respondents, the grass pea consumption 64% was maximum in Goaurichonno and 51% was minimum in Imamkathi. Among pulse grains

consumption, lentil 28% was maximum in Shirampur and 15% was minimum in Borobegay. 22% respondents was consumed Mungbean at their servings in Imamkathi hold first position.

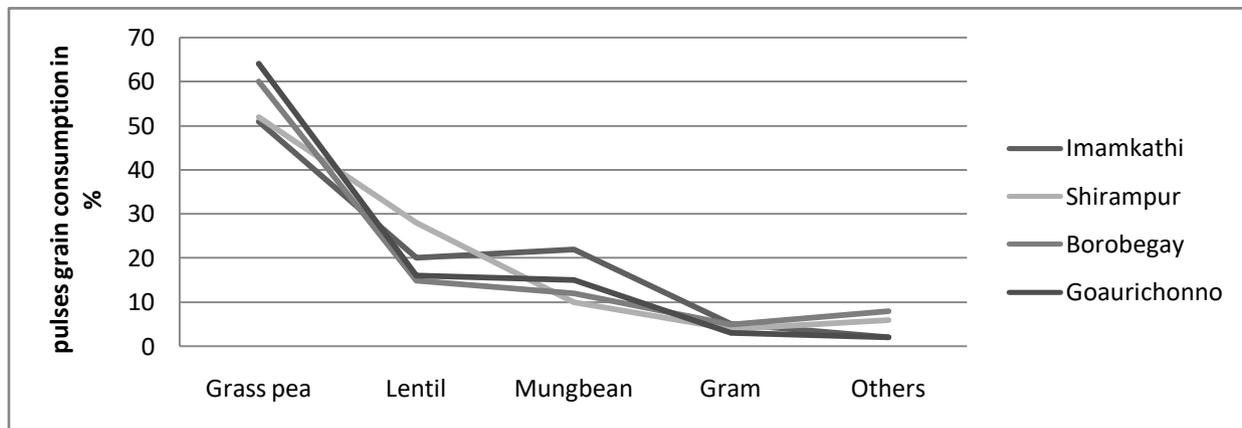


Figure 1: Consumption of various pulses in daily diet in the southern central coastal area of Bangladesh

e) *Processing of grass pea grain at food items preparation*

Now all of the respondents in southern-coastal areas grass pea grains were soaked in clean water for few hours to soften then rinsing by clean water thoroughly in several times at their various food items preparation. 95.75% respondent was used various spices like (onion, garlic, chili, tamarind etc.) with grass pea to making food items to increasing its palatability and testes. Only 4.25 respondents were used grass pea as solitary to making food items in some cases.

f) *Methods of consumption of grass pea in diet*

In the southern-coastal area of Bangladesh People was consumed grass pea as various food items. Among those they prefer Dahl barta was a maximum 25.25% and then as Dahl charchari 19.75%, Dahl bora (piaju) 19.5% respectively in these areas. Comparatively lower amount of grass pea ate as Dahl vaja, Panidahl and Dobakhesari (snack) by the respondents of these villages.

Table 4: Various grass pea food items consumption in (%) at the southern central coastal area of Bangladesh

Forms of khesari meal	Imamkathi	Shirampur	Borobegay	Goaurichonno	Mean
Dahl barta	22	26	23	30	25.25
Dahl charchari	23	21	15	20	19.75
Dahl bora (piaju)	24	17	22	15	19.5
Dahl vaja	2	3	5	2	3
Chaldahlkhichuri	5	8	10	5	7
Kaloyesak (young shoot)	17	14	15	18	16
Liquid dahl (panidahl)	2	3	2	4	2.75
Sabji/dim chop	5	8	7	4	6
Dobakhesari (snack)	0	0	1	2	0.75

Note: Grass pea food items was given as a local name.

g) *Duration of the consumption of grass pea in the diet of respondents*

90 % respondents was consumed grass pea in their servings for five years or more in the southern-central coastal area of Bangladesh. 93% respondents

consumed grass pea was highest in Borobegay and lowest in Imamkathi was 88%. Only 2.50% respondent was consumed Grass pea Six months to one year from in that surveyed areas.

Table 5: Duration of consumption of grass pea in diet on life of respondent

Characteristics	Imamkathi	Shirampur	Borobegay	Goaurichonno	Mean
How many months or years do you taken this <i>dal</i> (grass pea) in your meal? (%)					
One month to six months	00	00	00	00	00
Six months to one year	04	03	01	02	2.50
One year to five years	08	07	06	09	7.50
Above five years	88	90	93	89	90

h) *Disease occurrence of the respondents among four villages*

In these four villages respondents was not suffered from neurolathyrism paralytic diseases in the

south-central coastal area of Bangladesh. About 14.25% respondents of the surveyed areas suffered from skin diseases was highest. Most 61.5% of respondents have no diseases occurrence at surveyed time.

Table 6: Disease occurrence of the respondents among four villages

Characteristics	Imamkathi	Shirampur	Borobegay	Goaurichonno	Mean
Do you have any chronic disease? (%)					
Neurolathyrism	0	0	0	0	0
Diarrhea	10	12	15	19	14
Dysentery	8	11	10	12	10.25
Skin diseases	12	10	16	19	14.25
No diseases	70	67	59	50	61.5

i) *Detection of neurolathyrism among paralytic patients at Shere-e-Bangla Medical College and hospital*

In the southern coastal area of Bangladesh, there were no detected any neurolathyrism affected paralysis patients (caused by continuous consumption

of grass pea) among 500 admitted patients at medicine department in Sher-e-Bangla Medical College and hospital. Among these paralysis patients 90.4% were higher suffered from stroke, 0.4% due to drug (Isoniazid) was lower.

Table 7: Prevalence of various types of paralysis patient in (%) at the Shere-e-Bangla medical college and hospital

Common type of paralysis diseases	No. of patient	Mean
Neurolathyrism	0	0
Stroke	452	90.4
Guillain-Barre Syndrome/GBS	13	2.6
Acute transverse myelitis	8	1.6
Nutritional deficiency	7	1.4
Motor neuron disease	6	1.2
Metastasis to spine & spinal cord	5	1
Trauma to spine	4	0.8
Myasthenia gravis	3	0.6
Isoniazide drug	2	0.4

IV. DISCUSSION

The Socio-economic and demographic profile of the respondents was poor in the south-central coastal area of Bangladesh. Among respondents 63% were Male and 37% female were less due to cultural restrictions, they were less comfortable to communicate with a male. The literacy rate among the villages found to be 38.75%. Among them 41.5% was completed primary education. About one third 30% of the respondents' monthly income was Tk.6000-9500, 26.5% were above Tk.9500 and 7.50% had no income

(Table 01). Most of them depended on agriculture as an occupation. The most commonly cultivated crop in the study area is paddy (*Oryza sativa*) which is sown in July to October season, and it is a major part of diets. Grass pea is mainly cultivated during rabbi season mostly as relay crop in paddy field due to it can withstand low moisture in summer and gives a good yield.

Most of the respondents 94.5% in these areas consumed rice as the stable food and few of them 5.5 % respondent used wheat whose have diabetics' problem in this area. Grass pea or other food grains was not consumed as the stable food in those area. The amount

of grass pea consumed by a majority respondents 89.6% of those villages were 1/3 or less than at its proportion in a meal. Neurolathyrism occurs after prolonged over-consumption of grass pea seed during several months as staple food in an unbalanced diet (Haque A. et al.; 1996) which favors the people of this area can be used grass pea as protein source without scared. Respondents consumed meat, fish, milk, egg, vegetables also in their meal. These types of food items have rich in s- amino acid which may protected from neurolathyrism (Getahun H, Lambein F, Vanhoorne M, Van der Stuyft P, 2005).

Grass pea is probably the most drought tolerant legume crop and it is also resistant to moderate salinity. In this area people has grown plenty of grass pea as relay cropping with rice. Generally grass pea was cheaper than other pulse crops. For poor economic condition of the people they were not able to buy others pulses. Among the pulse grain consumption the grass pea consumption was always higher than others due to its palatability, tested, easy accessible, cheapness etc. in these areas.

Now all of the respondents in southern- coastal areas grass pea grains were soaked in clean water for few hours before they have cooked. They soaked for softening grains to decrease cooking time and also rinsed by water thoroughly in several times to clean on various food items preparation. Although they have not knowledge to the procedure of reduce toxin (ODAP) but their softening and cleaning method decrease the toxin level ultimately well. These ideas have similarity by (Cohn D F, Streifler, 1981).

Several studies have documented that grass pea is consumed in a variety of forms (Roldan *et al.* 1994; Haque *et al.* 1996; Getahun *et al.* 1999) but very few have attempted to associate the type of grass pea preparation with the risk of neurolathyrism. In the south-central coastal areas people consumed grass pea as various food items. Among these they preferred *Dahl varta* (Seeds are boiled, salted and grinding and gave shape as ball with chilly and mustard oil) was maximum 25.25% and then as *Dahl charchari* (Splits seeds cooked as solitary form) 19.75% *Dahl bora / Piaju* (deep-fried in oil of paste ball with onion and spices) 19.5% in those areas. All classes of people ate vegetables of grass pea in those areas. The least amount of people ate grass pea 2.75% as liquid dal (aqueous slurry cooked with spices) due to scared on neurolathyrism. The people of these villages use lentil as liquid form instead of grass pea mostly all servings in their diet and used various spices like (onion, garlic, chili, tamarind etc.) with grass pea to making food items to increasing its palatability and testes. These diet habits grass-pea preparations with cereals may reduce risk of neurolathyrism which have similarity by (Getahun H, Lambein F, Vanhoorne M, Van der Stuyft P, 2003).

Among 400 respondents of four villages and 500 paralytic patients admitted at medicine department in Sher-e-Bangla Medical College and hospital from those areas neurolathyrism patients not detected caused by continuous consumption of grass pea. Due to poverty (40-60 years) ago, the person of this region was consumed grass pea continuously and a great part at green stage also, so there was a chance to attract by Neurolathyrism (Paralysis).

V. CONCLUSION

In the present study confirmed that greater amount of grass pea was being consumed as supplementary nutrients in their diet without neurolathyrism health problem among the all classes of people in the south-central coastal area of Bangladesh. It was also evident from this study that people's food habits grass pea consumed mixed with cereals and spices or other food ingredients and soaking and cleaning of grass pea, consumed meat, milk, fish, vegetables etc. as supplementary food did not lead to neurolathyrism. People can be consumed grass pea without scared even marginal sections of people perhaps increased the nutritional status. If the nutritional value of this pulse can be utilized effectively, it may become a good source of protein.

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REFERENCES RÉFÉRENCES REFERENCIAS

1. Cohn D F, Streifler M; (1981). Intoxication by the chuckling pea (*Lathyrus sativus*): nervous system and skeletal findings. *Arch Toxicol Suppl.* 1983; 6: 190-3.
2. Eguchi K K, Yoshino N, Minoura A, Watanabe K, Kusama T, Lambein F, Ikegami F. 2011. Sulfur amino acids deficiency caused by grass pea diet plays an important role in the toxicity of l-β-ODAP by increasing the oxidative stress: Studies on a motor neuron cell line. *Food and Chemical Toxicology* 49(3) 636–643.
3. Getahun H, Mekkonen A, Teklehaimanot R & Lambein F (1999) Epidemic of neurolathyrism in Ethiopia. *Lancet* 354, 306–307.
4. Getahun H., Fernand Lambein, F., Vanhoorne, M., Stuyft, Patrick Vander, 2003. Food-aid cereals to reduce neurolathyrism related to grasspea preparations during famine. *Lancet* 362, 1808–1810.
5. Getahun, H., Fernand Lambein F., Vanhoorne, M., Stuyft, Patrick Vander, 2005. Neurolathyrism risk

depends on type of grass pea preparation and on mixing with cereals and antioxidants. *Trop. Med. Int. Health* 10, 169–178.

6. Haque A, Hossain M, Khan J K, Kuo Y H, Lambein F, De Reuck J. 1994 New findings and symptomatic treatment for neurolathyrism, a motor neuron disease occurring in North West Bangladesh. *Paraplegia*. 32: 193-5.
7. Haque A., Hossain M, Wouters G & Lambein F (1996) Epidemiological study of lathyrism in northwestern districts of Bangladesh. *Neuroepidemiology* 15, 83–91.
8. IPBO; 2009. *Lathyrussativus*. Available at [Http://www.ipbo.Ugent.Be/Activities/OurResearch/lathyrus.htm](http://www.ipbo.Ugent.Be/Activities/OurResearch/lathyrus.htm); Accessible on 05March.
9. Lambein F, Kuo Y H, Ikegami F, Kusama-Eguchi K, Enneking D. In: Kharkwal MC, editor. 2008. Food legumes for nutritional security and sustainable agriculture, vol. 1. New Delhi: Indian Society of Genetics and Plant Breeding. Indian Council of Agricultural Research; p. 422-32.
10. Monsoor M A, Yusuf H K. 2002. In vitro protein digestibility of *Lathyruspea* (*Lathyrussativus*) lentil (*Lens culinaris*) *Lens culinaris*) and chickpea (*Cicerarietinum*). *Int J Food Sci Technol*; 37: 97-9.
11. Rao SLN; 2001. Do we need more research on neurolathyrism? *Lathyrus Lathyrism Newsletter*; 2: 2-3.
12. Roldan S G, Ludolph A C, Hugon J et al. (1994) Lathyrism in Spain: progressive central nervous system deficits more than 45 years after onset. In: *Nutrition, Neurotoxins & Lathyrism: The ODAP Challenge. Proceedings of the Second International Lathyrus/Lathyrism Conference in Ethiopia* (eds B M Abegaz, R T Haimanot, V S Palmer & P S Spencer). Third World Medical Research Foundation, New York.
13. Stodolak B, Starzynska-Janiszewska A. The influence of 4.tempeh fermentation and conventional cooking on anti-nutrient level and protein bioavailability (in vitro test) of grass-pea seeds. *J Scifood agri* 2008; 88: 2265-70.
14. Spencer P S, Ludolph A C, Kisby G E. 1993. Neurologic diseases associated with use of plant components with toxic potential. *Environmental Research* 62(1), 106–113.
15. Sriram K, Shankar S K, Boyd M R, Ravindranath V. 1998. Thiol Oxidation and Loss of Mitochondrial Complex I Precede Excitatory Amino Acid-Mediated Neurodegeneration. *The Journal of Neuroscience* 18 (24).10287–10296.
16. Yang. Hui-Min and Zhang. Xiao-Yan, 2005. Considerations on the reintroduction of grass pea in China. *Lathyrus Lathyrism Newsletter* 4 (2005). College of Pastoral Agriculture Science and Technology, Lanzhou University, Lanzhou 730020, China.