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.

Keywords: grass pea, consumption, neurolathyrism.

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1. 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 parapares is related to the over consumption of the legume Lathyrus sativus 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 Patuakhali sadar 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 diet and detection of neurolathyrism patients in each village 50 households and 100
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 neurolathyrism 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 neurolathyrism 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 was 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 of 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**

| 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.

| 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.

| 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 ≥ 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  |
|                                                      | No         | 0         | 0         | 0             | 0    |

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

**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.

**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    |
| Kaloyasak (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 were 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.

| Characteristics                      | Imamkathi | Shirampur | Borobegay | Gaourichonno | Mean |
|--------------------------------------|-----------|-----------|-----------|--------------|------|
| How many months or years do you taken this *dal* (grass pea) in your meal? (%) |           |           |           |              |      |
| One month to six months              | 0         | 0         | 0         | 0            | 0    |
| 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.

| Characteristics                      | Imamkathi | Shirampur | Borobegay | Gaourichonno | 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.

| 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 / Plaju (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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