

## Development of Gluten Free Chapatti for Celiac Patients

Mahnaz Nasir Khan<sup>1</sup>, Dr. Aniqah Sohail<sup>2</sup>, Nasreen Kausar<sup>3</sup>, Samia Khalid<sup>4</sup>, Kiran Saleem<sup>5</sup>

<sup>1</sup>Assistant Professor, Food Science and Human Nutrition Department,  
Kinnaird College for Women Lahore, Pakistan

<sup>2</sup>Assistant Professor, Central Park Medical College, Lahore, Pakistan

<sup>3</sup>Lecturer, Food Science and Human Nutrition Department, Kinnaird College for Women, Lahore, Pakistan

<sup>4</sup>Lecturer, Food Science and Human Nutrition Department, Kinnaird College for Women, Lahore, Pakistan

<sup>5</sup>Student, Food Science and Human Nutrition, Kinnaird College for Women, Lahore, Pakistan

### ABSTRACT

*Celiac disease is an autoimmune disorder of intestine. The cornerstone treatment for celiac disease is elimination of gluten from diet. In celiac patients gluten free diet results in complete symptomatic resolution of disease and reduced the risks of complications. The study was focused upon developing gluten free chapatti for celiac disease patients. All gluten free ingredients with different proportions of four gluten free flours were used. Total of 30 experiments were carried and one gluten free recipe for chapatti was formulated. A clinical trial was carried out on 15 patients visiting the OPD of WAPDA Hospital. The chapatti was accepted for its sensory traits of appearance, taste, texture and recipe by trained panel of expert judges. The study indicated that the gluten free chapatti was similar to regular wheat chapatti and can be easily consumed by celiac patients. Clinical trial showed improvement in symptoms of celiac disease. As chapatti is the staple food of Pakistani population, the importance of the gluten free chapatti for patients of celiac disease could not be overlooked. The study resulted in development of cost effective gluten free chapatti that was similar to regular wheat chapatti in all the sensory traits.*

**Key words:** Celiac Disease, Gluten free, Chapatti

## **I. INTRODUCTION**

Celiac disease -- also known as celiac sprue or gluten-sensitive enteropathy – is an autoimmune disorder of the small intestines that occurs in genetically predisposed people of all ages. It is an abnormal immune mediated response to protein gluten of different cereal (Bianchi & Bardella, 2002) and is characterized by damage of small intestine mucosa by protein fraction of wheat gluten and prolamines of barley and rye (Fasano et al. 2001).

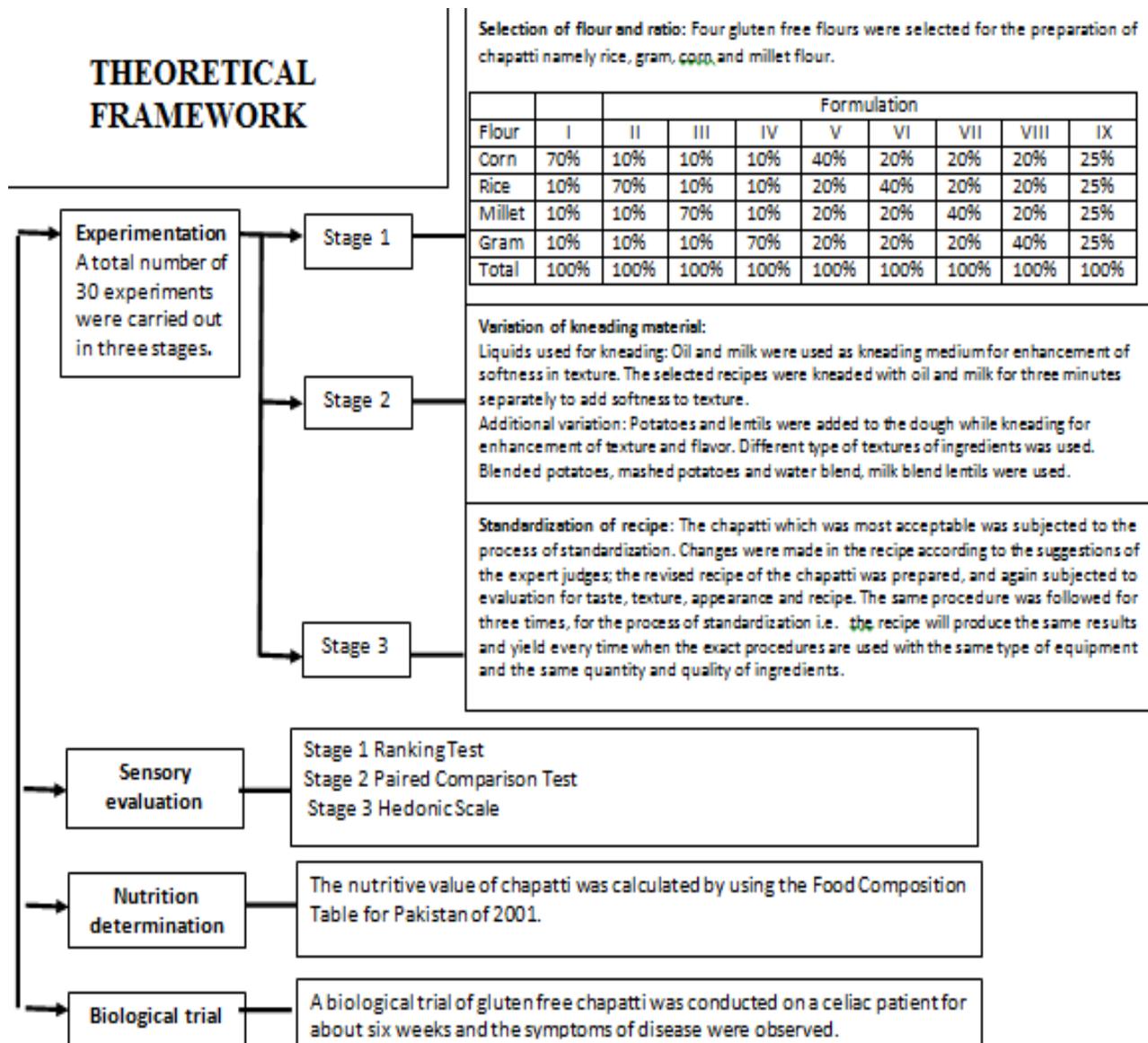
The deleterious effect of protein gluten in diseased patients is explained by the change of small intestinal mucosal shape. It includes the replacement of long shaped villi and short crypts with short or absent villi and hyperplastic crypts (Braegger & MacDonald, 1996). This damage to the intestine makes it hard for the body to absorb nutrients, especially fat, calcium, iron, and folate. Thus, people with celiac disease have poor absorption and symptoms include abdominal bloating, diarrhea, constipation and fatigue (Hallert et al. 2002).

The cornerstone treatment for celiac disease is elimination of gluten from diet. In celiac patients gluten free diet results in complete symptomatic resolution of disease and reduced the risks of complications (Abdulkarim et al., 2002). Strict avoidance of wheat, rye, and barley and their derivatives will result in intestinal healing and relief of symptoms for the majority of individuals with celiac disease. The gluten free diet is simple in principle; however, completely eliminating all foods and ingredients with gluten is very challenging (Harris et al. 1989), especially in Pakistan where the staple food is wheat chapatti.

Availability of gluten-free flour or products is limited in Pakistan not to mention its high cost making it difficult to afford at all socio-economic levels. This emphasized the need for development of cheap gluten free gluten free chapatti which is affordable and is not very different from regular chapatti at the household level.

## **II. METHODOLOGY**

The Study design was experimental and experiments were conducted for formulation of Gluten free Chapatti. Theoretical framework for the research study has been provided (Figure 1).



The study focused on development of gluten free chapatti and one gluten free chapatti was made by using four different types of gluten free flours namely rice flour, gram flour, corn flour and millet flour. Different proportions of flour were formulated (Table 1) to make chapatti similar in taste to regular wheat chapatti.

**Table 2 Mean Scores of Sensory Evaluation of final flour formulation recipe for chapatti**

	Test 1	Test 2	Test 3
Traits	Mean score	Mean score	Mean score
Appearance	6.50	7.25	7.75
Texture	6.75	7.75	8.00
Taste	7.00	7.00	8.00
Recipe	7.00	7.75	8.00

The process of standardization was conducted three times to get the similar chapatti like regular wheat chapatti through 1 to 9 hedonic scale. In the first process of standardization appearance, texture, taste, and recipe execution were rated 6.50, 6.75, 7.00, respectively. In the second attempt evaluation rates of appearance, texture, taste, and recipe execution were improved to 7.25, 8.00, 7.00, and 7.25 respectively. In the last attempt of standardization average mean score was highest and desirable. The appearance, texture, taste, and recipe execution were given the highest score of 7.75, 7.50, 8.00 and 8.00 respectively. The nutritional facts of gluten free chapatti are approximately equal to regular wheat chapatti as evidenced by (Table 2).

**Table 3 Estimation of Nutritive Value for final flour formulation recipe for chapatti**

Nutrition Facts	Wheat Chapatti	Gluten free Chapatti
Energy (Kcal)	195	219
Protein (gram)	6.7	7
Fat (gram)	1	2.5
Carbohydrate (gram)	43.3	44
Fiber (gram)	0.6	1

**Table 4 Clinical trial of gluten free chapatti**

Symptoms	3 weeks		6 weeks			
	N	%	N	%		
Abdominal bloating	Decrease in bloating after meal	7	47	Normal Abdominal functions	12	80
Muscle cramps	Decrease muscle cramps	13	87	No muscle cramps	15	100
Stomach pain	Decrease stomach pain after taking meal	14	93	No stomach pain	15	100
Increased frequency of pale stools	Decrease in frequency of stool per day	10	67	Normal frequency of stools	12	80
Weight loss	Maintenance of weight loss	10	67	No loss of weight	13	87

The gluten free chapatti markedly reduced the symptoms of bloating and distension within 6 weeks of consumption of the gluten free chapatti.

## II. CONCLUSION

The study concluded that gluten free chapatti could be prepared by simply varying the proportion of different gluten free flours at the household level. The chapatti was accepted both for its sensory parameters and for biological trial by celiac patients.

## III. ACKNOWLEDGEMENTS

The research was based on developing gluten free chapatti for celiac patients. I would like to thank WAPDA Hospital and Food Science and Human Nutrition Department of Kinnaird College for Women, for making this research project possible and helping in conducting the research.

## IV. REFERENCES

- Abdulkarim, A. S., Burgart, L. J., See, J., & Murray, J. A. (2002). Etiology of nonresponsive celiac disease: results of a systematic approach. *The American Journal of Gastroenterology*, 97, 2016-2021.
- Bianchi, M. L. & Bardella, M.T. (2002). Bone and Celiac Disease. *Calcified Tissue International*, 71 (16), 465-71.
- Braegger, C.P. & MacDonald, T. T. (1996). The Immunologic Basis for Celiac Disease and Related Disorders. *Seminars in Gastrointestinal Disease*, 7 (3), 124-33.
- Fasano, A., Berti .I., Gerarduzzi .T., Colletti, R. B., Drago, S., Elitsur, Y., Green, P.H., Guandalini, S., Hill, I.D., Pietzak, M., Ventura, A., Thorpe, M., Kryszak, D., Fornaroli, F., Wasserman, S.S., Murray, J.A., & Horvath, K. (2003). Prevalence of Celiac Disease in at risk not at risk groups in United States. *Archives of Internal Medicine*, 163 (3), 286-292.
- Hallert, C., Grant, C., Grehn, S., Grännö, C., Hultén, S., Midhagen, G., Ström, M., Svensson, H., & Valdimarsson, T. (2002). Evidence of poor vitamin status in Celiac patients on a Gluten Free Diet for 10 years. *Alimentary Pharmacology and Therapeutics*, 16 (7), 1333-1339.
- Harris, O.D., Cooke, W.T., Thompson,J.A., & Homes, A.,(1988). Malignancy in adult celiac disease and idiopathic steatorrhea.899-912.