RESEARCH ARTICLE

SAMRIDDHI Volume 12, Issue 2, 2020 Print ISSN: 2229-7111 Online ISSN: 2454–5767

Prevalence of Celiac Disease in Punjab, North-India: A Case Study

Sunny Thukral*, Harpreet Kaur

Sant Baba Bhag Singh University, Jalandhar 144030, India

Abstract

Celiac disease is diagnosing throughout clinical trials for the last six decades. Due to problematic symptoms, it is inconceivable to believe about celiac disease in resemblance to gastro-intestinal disorders. Celiac patients are leading with the HLQ DQ2/DQ8 gene present in the body. Numerous types of symptoms emerge in the body after the consumption of wheat in the diet. The present study was conducted in Punjab, North-India, on 700 selves using a questionnaire strategy. 393 males and 307 females have engaged in the survey. Factor analysis practiced to elect the most apparent symptoms given by celiac patients implemented in the SPSS tool. 134 celiac patients were detected, with 75 females and 59 males. The tTG-IgA is judged to be the most beneficial clinical tool for celiac disease diagnosis. The prevalence of celiac disease believed to be 1:52 of the survey in Punjab.

Keywords: Body Mass Index, Celiac Disease, SPSS, Weight Loss.

SAMRIDDHI : A Journal of Physical Sciences, Engineering and Technology (2020); DOI: 10.18090/samriddhi.v12i02.9

Introduction

Celiac patients are progressing rapidly throughout the world. It is a chronic disease class that endures in those bodies carrying haplotypes DQ2/DQ8 in the body.[1] Gee gave the notch of celiac disease in 1888.[2] After ingestion of gluten in the entity, an afflicted individual grieves painful symptoms that appear instantly. The signs are abdominal bloating, anemia, fatigue, abdominal pain, vomiting, skin rashes, diarrhea, failure to thrive, delayed growth, vitamin levels, anxiety, depression, etc.[3] The manifestations diverged from patient to patient depends upon ppm (parts per million) gluten intake. The problem was thoughtful during the world war when wheat grain lessens in specific countries, which leads to a decline in symptoms.[5] Wheat consists of gluten quantity in the preponderance. So, the concept of gluten-less products was prefaced to grab the celiac disease.[6] Another paradigm is to concentrate on appliances used for the preparation of food because a minority of gluten will cause the small intestine. The various types of symptoms develop after taking gluten products are as follows:

- *Abdominal Bloating:* Stomach tightness is estimated as a common sign of celiac patients promulgated throughout the world.[7]
- *Anemia:* Low blood count is an indispensable symptom among celiac patients. Often celiac patients stated anemia problems due to gastro-intestinal disorders.
- *Abdominal Pain:* This is very prevalent in celiac patients. Most of the patients informed severe abdominal pain after the intake of wheat or gluten products.[8]
- *Enamel Effects:* Few celiac patients reported enamel problems consistently. Many researchers stipulated gum problems granted by the celiac patients.
- *Diarrhea:* Another grim symptom that resembles virtually all celiac patients referred to as diarrhea. If considered in the diet, wheat is not gently to digest because gluten performs as a toxic agent.
- *Vomiting:* Due to non-digestion, vomiting transpires as stated by celiac patients. Vomiting & diarrhea are the central symptoms due to gastro-intestinal disorder.[9]
- *Fatigue:* Because of diverse symptoms after intake of gluten, weakness occurs rapidly in the body.
- *Irritation:* Irritation is another symptom replied by celiac patients. It also commences to worry or some sort of fear continually.
- *Dermatitis Herpetiformis:* Another critical symptom is skin rash, in which outbreaks arise in different parts of the body after taking gluten products.[10]

Corresponding Author: Sunny Thukral, Sant Baba Bhag Singh University, Jalandhar 144030, India, e-mail: sunnythukral@davcollegeasr.org

How to cite his article: Thukral, S., & Kaur, H. (2020). Prevalence of Celiac Disease in Punjab, North-India: A Case Study. *SAMRIDDHI : A Journal of Physical Sciences, Engineering and Technology,* 12(2), 106-111.

Source of support: Nil

Conflict of interest: None

Table 1: Study on Celiac disease

Authors	*Clinical Trails*	*Outcome*
Gulsern *et al*.[11]	tTG testing	10 celiac patients
Senapati *et al*.[12]	Genetic testing	Halotype gene as 70% risk factor
Digiacomo *et al*.[13]	Low Lipoprotein	49 celiac patients
Ford[14]	tTG and biopsy	Gut damage in the small intestine
Sood *et al*.[15]	tTG testing	14 celiac patients
Maki *et al*.[16]	tTG, IgA, and genetic testing	27 celiac patients

- *Failure to Thrive:* Brisk weight loss is the token of celiac disease. A reduction in weight signifies a prospect of celiac disease.

So, these are the general symptoms present in almost all celiac patients. Additionally, liver abnormalities, brain fog, and low vitamin levels indicate celiac disease.[9-10] Furthermore, Section 2 signifies a literature review on celiac disease stipulated by several researchers in the past years with wide-ranging tests to diagnose celiac disease. Section 3 discusses the diagnosis procedure to progress step by step for the authentication of celiac disease. Section 4 comprises a multi-subsection, which concentrated on the study conducted in Punjab with celiac patients, corresponding to gender, age-group, awareness, diagnostic procedure, etc.

Literature Review

Researchers did exceptionally well to accomplish submissions in diagnosing celiac disease with multiple clinical examinations. In 2018, Gulsern *et al*.[11] investigated 39 individuals and utilized the tTG and EMA testing approach for diagnosing celiac disease by getting 10 celiac patients. The critical paradigm of the author was to classified invasive and invasive tests for celiac disease detection. Another representation was given by Senapati *et al*.[12] in 2014 with a survey in India and the Netherlands to identify celiac disease based on genetic testing. It was proven that 70% risk factor to those individuals carrying halotype gene. This research also gives a comparative analysis of the two countries in terms of genetic testing. In the preceding year, Digiacomo *et al*. [13] performed a case study on 7762 selves in the USA to discuss celiac disease with clinical tests. 49 celiac patients were found among them; females representation was more than male occurrence. In 2009, Ford [14] studied neurological disease with biopsy to judge celiac disease and evaluate with gut damage in the small intestine. Biopsy still considered being the golden procedure to diagnose celiac disease.

In 2006, a vital study was performed by Sood[15] and his team members on more than 4000 children in Punjab. 14 celiac patients were diagnosed using a tTG clinical trial with prevalence marked as 1:310. Maki *et al*.[16] studied Finland's children with various testing techniques. 27 children were found to be celiac with a prevalence factor as 1: 99. So, these are the general studies, as illustrated in Table 1, with relevance for finding celiac disease concerning different clinical examinations throughout the world.

Table 2: Frequency of Celiac Patients

Celiac Patient	Frequency	Percent
Yes	134	19.1
No	566	80.9
Total	700	100.0

Celiac Disease Diagnosis Procedure

The method of diagnosing celiac disease depends on the value of tTG-IgA. If the amount surpasses 10 U/mL, then that individual is indicated as celiac.[17] If the value is shorter than 10 U/mL, symptoms already in an individual commences to thinking about the biopsy procedure.[18] Through biopsy, gut damage can be detected if it transpire in the small intestine related to as a celiac person. Another method is to check through genetic testing to check halotype present in the body or not, i.e., HLQ DQ2/DQ8. An individual is said to be celiac if anyone of the genes impersonates in the body with symptoms. In case of any type of defiance among celiac tests, we must progress with gluten-sensitivity tests for other chronic diseases due to replicate symptoms among conditions.[19]

North-India Survey

The survey was to attain celiac patients in North India, Punjab using a questionnaire approach. 700 individuals engaged in the study. Useful inputs were registered in terms of height and weight for the evaluation of body mass index. 393 males and 303 females filled the useful questionnaire with data in the sort of symptoms. 134 celiac patients were identified as represented in Table 2 and Figure 1.

The snowball sampling was conducted in the survey because of the first-degree relative concerning celiac disease. In other words, it is a sort of chronic disease that impersonates genetically due to the halotype gene.

Celiac Patients with Gender Information

A total of 75 females were distinguished as celiac patients, with a total of 307 females strived in the survey. In other words, 10.7% of females obtained from the overall participation of 43.9% of females. From 393 total participation of male individuals, 59 males were identified as celiac patients as

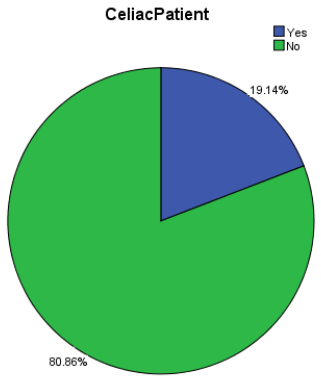

Figure 1: Pie-Chart Representation of Celiac Patients

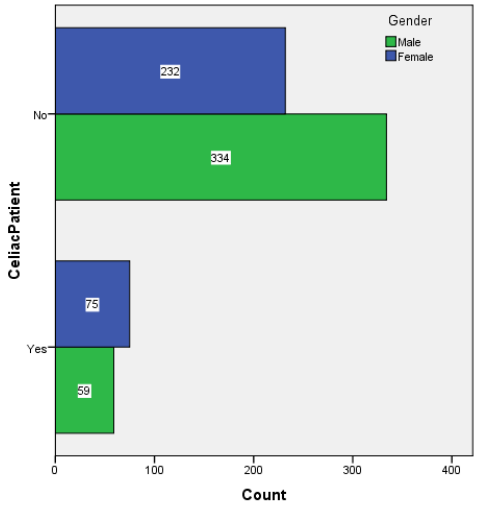

Figure 2: Bar-Chart Representation of Celiac Patients with Gender

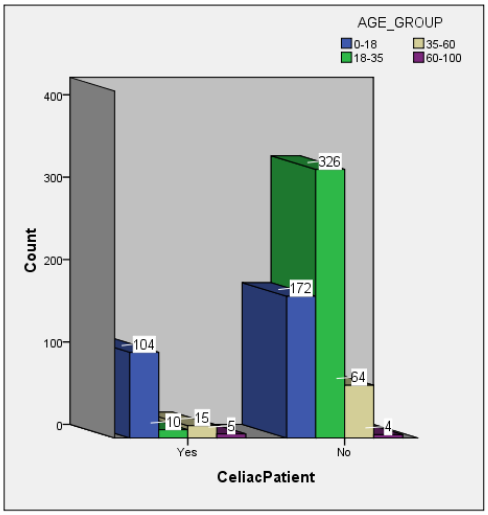

Figure 3: Bar-Chart Representation of Celiac Patients with Age-Group

depicted in Table 3. So, 134 celiac patients were recognized from 700 individuals stipulating a 19.14% prevalence ratio.

Table 3: Cross-Tabulation Report of Celiac Patients with Gender

			Gender		Total
			Male	Female	
CeliacPatient	Yes	Count	59	75	134
		% within CeliacPatient	44.0%	56.0%	100.0%
		% within Gender	15.0%	24.4%	19.1%
		% of Total	8.4%	10.7%	19.1%
	No	Count	334	232	566
		% within CeliacPatient	59.0%	41.0%	100.0%
		% within Gender	85.0%	75.6%	80.9%
		% of Total	47.7%	33.1%	80.9%
Total		Count	393	307	700
		% within CeliacPatient	56.1%	43.9%	100.0%
		% within Gender	100.0%	100.0%	100.0%
		% of Total	56.1%	43.9%	100.0%

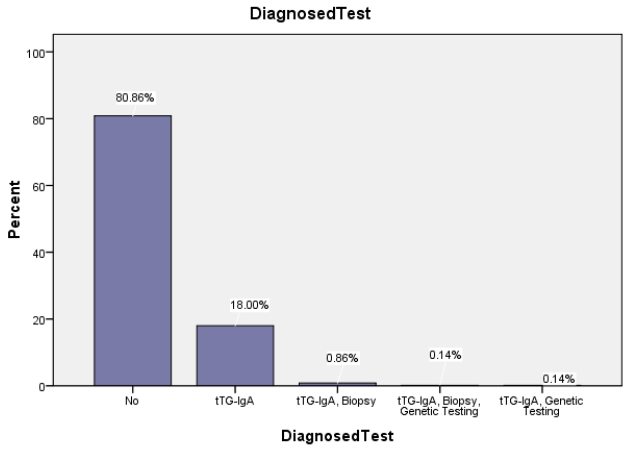

Figure 4: Bar-Chart Representation of Celiac Patients with Diagnosed Tests

The bar chart in Figure 2 represented blueprints that female participation was more limited in number in comparison with males, but the outcome in the reverse order. In other words, female celiac patients outnumbered males observed in the survey.

Celiac Patients with Age-Group

It is comprehended to obtain out precise age-group often influenced by celiac disease. 276 individuals participated in the 0-18 age group, with supreme celiac patients as 104 in number. In other words, from a total of 39.4% of celiac patients from the survey, 14.9% lies in the 0-18 age-group. The rest of the age-groups confer minimal celiac patients; among them, 15 celiac patients were seen in the 35-60 age-group. The most limited number of celiac was classified in the 60-100 age-group as specified in Table 4.

The bar-chart in Figure 3 for age-group exhibits clear representation with high peaks in 0-18 age-group points

Table 4: Cross-Tabulation Report of Celiac Patients with Age-Group

			AGE_GROUP				Total
			0-18	18-35	35-60	60-100	
Celiac Patient	Yes	Count	104	10	15	5	134
		% within Celiac Patient	77.6%	7.5%	11.2%	3.7%	100.0%
		% within AGE GROUP	37.7%	3.0%	19.0%	55.6%	19.1%
		% of Total	14.9%	1.4%	2.1%	.7%	19.1%
	No	Count	172	326	64	4	566
		% within CeliacPatient	30.4%	57.6%	11.3%	.7%	100.0%
		% within AGE GROUP	62.3%	97.0%	81.0%	44.4%	80.9%
		% of Total	24.6%	46.6%	9.1%	.6%	80.9%
Total		Count	276	336	79	9	700
		% within CeliacPatient	39.4%	48.0%	11.3%	1.3%	100.0%
		% within AGE GROUP	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	39.4%	48.0%	11.3%	1.3%	100.0%

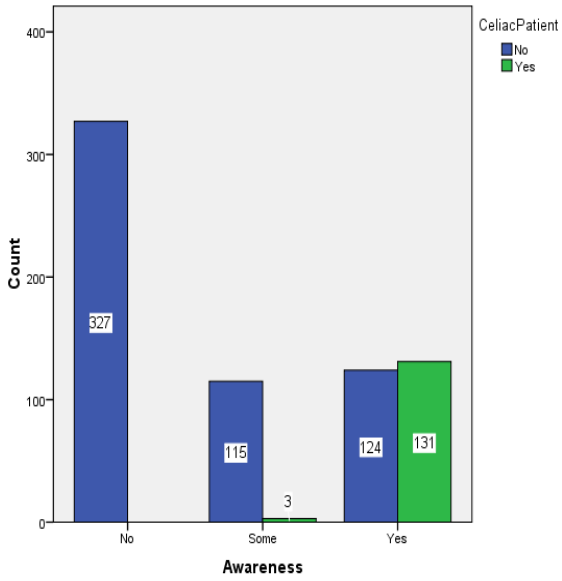

Figure 5: Bar-Chart Representation of Awareness among Celiac Disease

least affected in terms of non-celiac category as outlined in the figure.

Celiac Patients with Diagnosed Test

There are several clinical testing methods through which celiac disease is diagnosed. The tests are tTG-IgA, EMA, Biopsy, Genetic testing, etc. From 134 celiac patients obtained from the survey, the tTG-IgA test still pointed to as the golden way to detect celiac disease. 103 celiac patients were scrutinized via the tTG-IgA test with a 95.4% peak selection.

Table 5: Cross-Tabulation Report of Celiac Patients with Diagnosed Tests

		DiagnosedTest					Total
Celiac Patient		No	tTG-IgA	tTG-IgA, Biopsy	tTG-IgA, Biopsy, Genetic Testing	tTG-IgA, Genetic Testing	
Yes	Count	0	126	6	1	1	134
	% within CeliacPatient	.0%	94.0%	4.5%	.7%	.7%	100.0%
	% within DiagnosedTest	.0%	100.0%	100.0%	100.0%	100.0%	19.1%
	% of Total	.0%	18.0%	.9%	.1%	.1%	19.1%
No	Count	566	0	0	0	0	566
	% within CeliacPatient	100.0%	.0%	.0%	.0%	.0%	100.0%
	% within DiagnosedTest	100.0%	.0%	.0%	.0%	.0%	80.9%
	% of Total	80.9%	.0%	.0%	.0%	.0%	80.9%
Total	Count	566	126	6	1	1	700
	% within CeliacPatient	80.9%	18.0%	.9%	.1%	.1%	100.0%
	% within DiagnosedTest	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	% of Total	80.9%	18.0%	.9%	.1%	.1%	100.0%

Table 6: Cross-Tabulation Report of Awareness among Celiac Disease

			CeliacPatient		
			No	Yes	Total
Awareness	No	Count	327	0	327
		% within Awareness	100.0%	.0%	100.0%
		% within CeliacPatient	57.8%	.0%	46.7%
		% of Total	46.7%	.0%	46.7%
	Some	Count	115	3	118
		% within Awareness	97.5%	2.5%	100.0%
		% within CeliacPatient	20.3%	2.2%	16.9%
		% of Total	16.4%	.4%	16.9%
	Yes	Count	124	131	255
		% within Awareness	48.6%	51.4%	100.0%
		% within CeliacPatient	21.9%	97.8%	36.4%
		% of Total	17.7%	18.7%	36.4%
Total		Count	566	134	700
		% within Awareness	80.9%	19.1%	100.0%
		% within CeliacPatient	100.0%	100.0%	100.0%
		% of Total	80.9%	19.1%	100.0%

Three patients were diagnosed with tTG-IgA and Biopsy because tTG-IgA conferred an uncertain outcome with the preponderance of celiac patients. One patient reported the

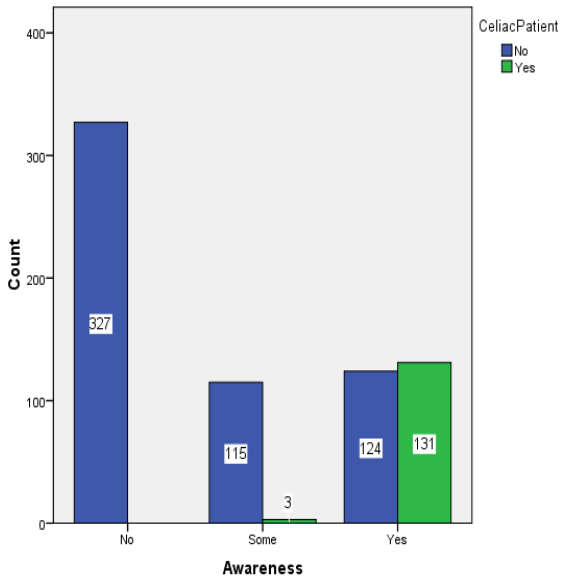

Figure 5: Bar-Chart Representation of Awareness among Celiac Disease

genetic testing procedure with tTG-IgA to authenticate the celiac disease, as delineated in Table 5 and Figure 4.

Awareness of Celiac Disease

The awareness of celiac disease amidst individuals is not a good mark. From the survey, it is evident that from 134 celiac patients, 255 precisely know about celiac disease. But, the challenging mark is 327 individuals do not comprehend about the illness, whereas 118 individuals slightly know about that disease.

Based on these values as portrayed in Table 6 and Figure 5, 255 individuals having information about celiac disease, but 445 individuals do not know or somewhat reported.

Conclusion

Celiac patients outnumbered females in association with males exposed to the survey. The awareness is not up to the mark due to ambiguous symptoms with complex diseases. 0-18 age group celiac patients were observed mostly affected by the study. The tTG-IgA test is referred to as the golden way to diagnose celiac disease, and a gluten-less diet is the only plan to handle the celiac disease. In the latter perspective, based on symptomatic input proffered by celiac patients, a prediction system is to be submitted using artificial intelligence or fuzzy logic, which is propitious for physicians to foresee celiac disease.[20-24]

References

[1] Kupper, C. (2005). Dietary guidelines and implementation for celiac disease.*Gastroenterology*, *128*(4 SUPPL. 1). https://doi.org/10.1053/j.gastro.2005.02.024

[2] Gee, S.J. (1888). On the coeliac affection. St. Bartholomew's Hosp Rep., *24*, 17-20.

[3] Dowd, B., & Walker-Smith, J. (1974). Samuel Gee, Aretaeus, and the coeliac affection.*Br Med J, 2*(5909), 45-47.

[4] Dicke, W.K., Weijers, H.A., &Vande, H. (1953). Coeliac disease II.The presence in wheat of a factor having a deleterious effect in cases of coeliac disease.*ActaPaediatr., 42*(1), 34-42. https://doi.org/10.1111/j.1651-2227.1953.tb05563.x

[5] Marsh, M. N. (1992). Gluten, major histocompatibility complex, and the small intestine.A molecular and immunobiologic approach to the spectrum of gluten sensitivity ('celiac sprue'). *Gastroenterology, 102*(1), 330-354.

[6] Husby, S., Koletzko, S., Korponay-Szabo, I. R., Mearin, M. L., Phillips, A., Shamir, R., … Nutrition. (2012). European Society for Pediatric Gastroenterology, Hepatology, and Nutrition guidelines for the diagnosis of coeliac disease.*JPediatr Gastroenterol Nutr, 54*(1), 136-160. doi:10.1097/MPG.0b013e31821a23d0

[7] Murry, J.A., Watson, T., Clearnnan, B., &Mitros, F. (2004). Effect of a gluten-free diet on gastro-intestinal symptoms in celiac disease.*Am J ClinNutr., 79*(4), 669-673. doi:10.10973/ajcn/79.4.669

[8] Revised criteria for diagnosis of coeliac disease. Report of Working Group of European Society of Paediatric Gastroenterology and Nutrition. (1990). *Arch Dis Child, 65*(8), 909-911.

[9] See, J., & Murray, J. A. (2006). Gluten-free diet: The medical and nutrition management of celiac disease. *Nutrition in Clinical Practice, 21*(1), 1-15. American Society for Parenteral and Enteral Nutrition. https://doi.org/10.1177/011542650602100101

[10] Biesiekierski, J. R., Newnham, E. D., Irving, P. M., Barrett, J. S., Haines, M., Doecke, J. D., … Gibson, P. R. (2011). Gluten Causes gastro-intestinal symptoms in subjects without celiac disease: A double-blind randomized placebo-controlled trial. *American Journal of Gastroenterology*, *106*(3), 508–514. https://doi.org/10.1038/ajg.2010.487

[11] Gulseren, Y.D., Adiloglu, A.K., Yucel, M., Dag, Z., …….Caydere, M. (2019). Comparison of non-invasive tests with invasive tests in the diagnosis of celiac disease.*J Clin Lab Anal.* 2019; 33:e22722. https://doi.org/10.1002/jcla.22722. PMID:30461063

[12] Senapati, S., Gutierrez-Achury, J., Sood, A., Midha, V., Szperl, A., Romanos, J., …Trynka, G. (2015). Evaluation of European coeliac disease risk variants in a north Indian population. *European Journal of Human Genetics*, *23*(4), 530–535. https://doi.org/10.1038/ejhg.2014.137

[13] Digiacomo, D. V., Tennyson, C. A., Green, P. H., &Demmer, R. T. (2013). Prevalence of gluten-free diet adherence among individuals without celiac disease in the USA: Results from the continuous national health and nutrition examination survey 2009-2010. *Scandinavian Journal of Gastroenterology, 48*(8), 921-925. https://doi.org/10.3109/00365521.2013.809598

[14] Ford, R. P. K. (2009). The gluten syndrome: A neurological disease. *Medical Hypotheses*, *73*(3), 438–440. https://doi.org/10.1016/j.mehy.2009.03.037

[15] Sood, A., Midha, V., Sood, N., Avasthi, G., &Sehgal, A. (2006). Prevalence of celiac disease among school children in Punjab, North India.*Journal of Gastroenterology and Hepatology (Australia)*, *21*(10), 1622–1625. https://doi.org/10.1111/j.1440-1746.2006.04281.x

[16] Mäki, M., Mustalahti, K., Kokkonen, J., Kulmala, P., Haapalahti, M., Karttunen, T., …Knip, M. (2003). Prevalence of Celiac Disease among Children in Finland.*New England Journal of Medicine*, *348*(25), 2517–2524. https://doi.org/10.1056/nejmoa021687

[17] Korponay-Szabó, I. R., Szabados, K., Pusztai, J., Uhrin, K., Ludmány, É.,Nemes, É., … Mäki, M. (2007). Population screening for coeliac disease in primary care by district nurses using a

rapid antibody test: Diagnostic accuracy and feasibility study. *British Medical Journal*, *335*(7632), 1244–1247. https://doi.org/10.1136/bmj.39405.472975.80

[18] Hopper, A. D., Cross, S. S., Hurlstone, D. P., McAlindon, M. E., Lobo, A. J., Hadjivassiliou, M., … Sanders, D. S. (2007). Pre-endoscopy serological testing for coeliac disease: Evaluation of a clinical decision tool. *British Medical Journal*, *334*(7596), 729–732. https://doi.org/10.1136/bmj.39133.668681.BE

[19] Dickey, W., McMillan, S.A., &Hughes, D.F. (2001). Sensitivity of serum tissue transglutaminase antibodies for endomysial antibody positive and negative coeliac disease.*Scand J Gastroenterol, 36*,511-514. doi:10.1080/00365520118975

[20] Thukral, S., &Rana, V. (2019). Versatility of Fuzzy Logic in chronic diseases: A review. *Medical Hypotheses, Elsevier, 122*, 150-156. doi:10.1016/j.mehy.2018.11.017

[21] Thukral, S., &Bal, J.S. (2019). Medical Applications on Fuzzy Logic Inference System: A review. *Int J. Advanced Networking and Applications*, *10*(4), 3944-3950.doi.org/10.35444/ijana.2019.10046

[22] Bascunan, K. A., Vespa, M. C., & Araya, M. (2017). Celiac disease: understanding the gluten-free diet. *Eur J Nutr, 56*(2), 449-459. doi:10.1007/s00394-016-1238-5

[23] Thukral, S., & Bal, J.S. (2020). Diagnosis of Celiac Disease using Fuzzy Logic Probabilistic System in North-Indian patients. *Journal of Clinical and Diagnostic Research*, June 2020; 14(6):KC01-KC04. doi.org/10.7860/JCDR/2020/44292.13805.

[24] Thukral, S., & Bal, J.S. (2020). Fuzzy Logic: An easiest technique to predict Celiac Disease. *Science and Technology Journal*, July 2020; 7(2):89-94. doi.org/10.22232/stj.2019.07.02.11