

Evaluation Of Serum Ferritin Level In Patients Presenting With Dysphagia: A Reliable Marker To Diagnose Plummer Vinson Syndrome

Rukhsana Tumrani¹, Afshan Qayum², Kashif Munir³, Ahmad Ijlal⁴, Mehwish Sana⁵

Abstract

Objective: The study aims to evaluate the serum ferritin level in patients presenting with dysphagia and to determine the frequency of low serum ferritin in Plummer-Vinson syndrome

Methods: Cross-sectional study conducted in the Department of Otorhinolaryngology and Department of Chemical Pathology, Sheikh Zayed Hospital, Rahim Yar Khan from November 2022 to September 2023. Patients between 20 to 60 years of age, both genders, presenting with dysphagia outdoors were included and subjected to the estimation of serum ferritin level and barium swallow to diagnose Plummer-Vinson syndrome. Data was collected on predesigned proforma for different variables. Serum ferritin level was estimated on a chemiluminescence-based immunoassay analyzer in serum sample and low ferritin level was labelled based on cut-off provided by the manufacturer i.e., 8ng/ml. Effect modifiers controlled through stratification and post-stratification chi-square test were used to see the statistically significant difference between subgroups. P value <0.05 was taken as significant.

Results: Mean age of the study subjects was 37.79 ± 8.45 years. 53(26.1%) were male and 150(73.9%) were females. Of the total 203 study subjects, 22(10.8%) were diagnosed as Plummer Vinson syndrome and among all these cases, 18(81.8%) had low serum ferritin ≤ 8.0 ng/ml with statistically significant difference between subgroups (p-value <0.001). The distribution of Plummer-Vinson syndrome patients concerning serum ferritin level (p-value <0.001), lifestyle (p-value 0.003), BMI (p-value 0.015) and carbonated drink user (p-value 0.008) shows a statistically significant difference between subgroups. No statistically significant difference was found concerning age, gender, residence and duration of illness with p-value>0.05.

Conclusion: Based on our study, it is concluded that serum ferritin level can be a useful marker in patients with Plummer-Vinson syndrome and it can help in early diagnosis and management of the patients to prevent its malignant transformation.

MeSH Keywords: Serum Ferritin, Dysphagia, Plummer-Vinson syndrome.

¹ Assistant Professor, Shalamar Medical & Dental College, Lahore; ^{2,4} Senior Registrar, Sheikh Zayed Hospital, RYK; ³ Consultant ENT Surgeon, THQ Hospital, Sadiqabad; ⁵ Assistant Professor, Children Hospital Multan.

Correspondence: Dr. Rukhsana Tumrani, Assistant Professor Chemical Pathology, Shalamar Medical & Dental College, Lahore. Email: r.tumrani33@gmail.com

Cite this Article: Tumrani R, Qayum A, Munir K, Ijlal A, Sana M. Evaluation of serum Ferritin level in patients presenting with dysphagia: A hidden marker to diagnose Plummer Vinson syndrome. JRMC. 2024 Sep; 27;28(3). 481-484. <https://doi.org/10.37939/jrmc.v28i3.2582>.

Received May 07, 2024; accepted August 27, 2024; published online September 26, 2024

1. Introduction

Plummer-Vinson syndrome is characterized by iron deficiency anaemia, dysphagia, and esophageal webs. Another name for it is the Paterson-Kelly condition. There have been reports of cases in children and young adults, but the majority of cases are found in middle-aged females between the fourth and seventh decade of life.¹ It is associated with an increased risk of squamous cell carcinoma of the pharynx and esophagus.² The most significant contributing component to the pathophysiology of Plummer-Vinson syndrome is thought to be iron deficiency anaemia, however, the exact cause is uncertain. Additional elements that could be accountable include nutritional deficiencies, autoimmune diseases like celiac disease, rheumatoid arthritis, autoimmune thyroid disorders, or genetic susceptibility.³ Painless and sporadic dysphagia can develop over the years, restricting its use in solid foods and occasionally being linked to weight loss. Fatigue, tachycardia, weakness,

and pallor are among the symptoms of anaemia that can predominate the clinical picture. In addition, koilonychias, glossitis, and angular cheilitis are its defining characteristics.⁴ Thyroid and spleen enlargement may also be seen.⁵ The development of upper gastrointestinal tract squamous cell carcinoma has been linked to Plummer-Vinson Syndrome. The patient needs to be constantly monitored since the risk of squamous cell carcinoma is elevated. The diagnosis of iron deficiency anaemia is predicated on the available data. The ideal metric to diagnose iron deficiency anaemia is serum ferritin. Mechanical dilation and iron supplementation are simple and efficient treatments for Plummer-Vinson syndrome.⁶ The significant improvement in nutritional status and utilization of fortified flour with iron has greatly decreased the prevalence of the syndrome.^{7,8}

The study aims to evaluate the level of serum ferritin in patients presenting with dysphagia and to determine the low serum ferritin level in patients with Plummer-

Vinson syndrome. Early identification of symptoms and diagnosis by non-invasive serum markers can help in early intervention to prevent its malignant transformation and improve the prognosis in patients with Plummer-Vinson syndrome.

2. Materials & Methods

After obtaining ethical approval from the institutional review board, cross cross-sectional study conducted in the Department of Otorhinolaryngology and Department of Chemical Pathology Sheikh Zayed Hospital, Rahim Yar Khan from November 2022 to September 2023. Patients aged between 20 to 60 years, both genders, presenting with dysphagia for more than 3 months duration in Otorhinolaryngology OPD were included and informed consent was taken. Patients with a recent attack of upper respiratory tract infection in the last month, post-cricoid growth assessed by history and medical record, chronic renal failure, and chronic liver disease were excluded. Sample size (n=203) was calculated by using the WHO calculator with using 95% confidence interval and, a 3% margin of error, taking an expected percentage of Plummer-Vinson syndrome in patients presenting with dysphagia as 5%. Non-probability consecutive sampling technique was used and included subjects were evaluated further to diagnose Plummer Vinson syndrome based on barium swallow and serum ferritin level was estimated for all subjects. A serum sample was taken and Ferritin was performed on Chemiluminescence immunoassay analyzer ACCESS II and the reference range provided by the manufacturer was used to label serum ferritin level as low (i.e., <8.0ng/ml). Data was collected and recorded on predesigned proforma. SPSS version 29 was used to analyze the data. Quantitative variables such as age, duration of illness, serum ferritin level (ng/ml) and BMI were presented in terms of mean and SD. Qualitative variables such as gender, residence, lifestyle, and carbonated drink users were presented in terms of frequency and percentages. All effect modifiers were controlled through stratification and the post-stratification chi-square test was used to see the statistically significant difference between subgroups. P value <0.05 was taken as statistically significant.

3. Results

Of the total 203 study subjects, 22(10.8%) were diagnosed with Plummer-Vinson syndrome and 181(89.2%) did not have Plummer-Vinson syndrome (Table 1). The mean age of study subjects was 37.79 ± 8.451 years with 44(21.7%) subjects having age

≤ 30 years and 159(78.3%) having age >30 years (Table 1). 53(26.1%) subjects were male while 150(73.9%) were females (Table 1).

Table 1: Distribution of study subjects concerning Age, Gender, Residence, Lifestyle, Carbonated drink user, BMI, Plummer-Vinson syndrome, Serum Ferritin level (n=203)

Variable	Subgroups	Frequency	Percentages
Age (years) <i>37.79±8.451</i>	≤ 30 years	44	21.7%
	>30 years	159	78.3%
Gender	Male	53	26.1%
	Female	150	73.9%
Residence	Urban	120	59.1%
	Rural	83	40.9%
Lifestyle	Simple	88	43.3%
	Sedentary	115	56.7%
Duration of illness (months) <i>5.89±1.443</i>	≤ 6 months	149	73.4%
	>6 months	54	26.6%
BMI (kg/m²) <i>28.83±3.363</i>	≤ 30	127	62.6%
	>30	76	37.4%
Carbonated drink user	Yes	112	55.2%
	No	91	44.8%
Plummer Vinson syndrome	Present	22	10.8%
	Absent	181	89.2%
Serum Ferritin level (ng/ml) <i>17.113±8.350</i>	Low	35	17.2%
	Normal	168	82.8%

120(59.1%) were resident of urban areas and 83(40.9%) were resident of rural areas (Table 1). 115(56.7%) were having a sedentary lifestyle. 149 (73.4%) were having duration of illness ≤ 6 months while 54(26.6%) were having duration of illness >6 months with mean duration of illness 5.89 ± 1.443 months (Table 1). 127 (62.6%) were having BMI $\leq 30 \text{kg/m}^2$ while 76(37.4%) were having BMI $>30 \text{kg/m}^2$ (Table 1). Of the total 203 study subjects, 112(55.2%) were carbonated drink users while 91 (44.8%) did not have a history of carbonated drink users (Table 1). Of the total 203 study subjects, 35(17.2%) had low serum ferritin levels while 168(82.8%) did not have low serum ferritin with mean serum ferritin level in all subjects at $17.113 \pm 8.350 \text{ng/ml}$ (Table 1). Of the total 22 subjects having Plummer Vinson syndrome, 8(36.36%) were ≤ 30 years of age while 14(63.63%) were >30 years age (Table 2). 2(9.09%) subjects having Plummer Vinson syndrome were male while 20 (90.90%) were females (Table 2). Of the total 22 subjects having Plummer-Vinson syndrome, 11(50%) were residents of urban areas and 11(50%) were residents of rural areas (Table 2). 19(86.36%) Plummer Vinson syndrome patients were having sedentary life style and 19(86.36%) were having BMI $\leq 30 \text{kg/m}^2$ (Table 2). Of the total 22 study subjects having Plummer-Vinson syndrome, 18(81.81%) were carbonated drink users and 17(77.27%) had ≤ 6 months duration of illness (Table 2).

Table 2: Cross-tabulation of variables such as age, gender, residence, lifestyle, duration of illness, BMI, carbonated drink user and serum ferritin level concerning the presence and absence of Plummer-Vinson syndrome (n=203)

Variable	Subgroup	Plummer Vinson Syndrome		Chi-square value	P value
		Present	Absent		
Age	≤30 years	8 (36.36%)	36(19.88%)	3.136	0.077
	>30 years	14(63.63%)	14580.11%		
	Total	22(100%)	181(100%)		
Gender	Male	2(9.09%)	51(28.17%)	3.704	0.054
	Female	20(90.90%)	130(71.82%)		
	Total	22(100%)	181(100%)		
Residence	Urban	11(50%)	109(60.22%)	0.848	0.357
	Rural	11(50%)	72(39.77%)		
	Total	22(100%)	181(100%)		
Lifestyle	Simple	3(13.63%)	85(46.96%)	8.871	0.003
	Sedentary	19(86.36%)	96(53.03%)		
	Total	22(100%)	181(100%)		
BMI (kg/m²)	≤30	19(86.36%)	108(59.66%)	5.968	0.015
	>30	3(13.63%)	73(40.33%)		
	Total	22(100%)	181(100%)		
Duration of illness (months)	≤6 months	17(77.27%)	132(72.92%)	0.190	0.663
	>6 months	5(22.72%)	49(27.07%)		
	Total	22(100%)	181(100%)		
Carbonated drink user	Yes	18(81.81%)	94(51.93%)	7.083	0.008
	No	4(18.18%)	87(48.06%)		
	Total	22(100%)	181(100%)		
Serum ferritin level (ng/ml)	Low	18(81.81%)	179(3.39%)	72.11	<0.001
	Normal	4(18.18%)	164(90.60%)		

18(81.8%) Plummer-Vinson syndrome patients had low serum ferritin while 4(18.18%) had normal serum ferritin levels (Table 2). Distribution of Plummer Vinson syndrome patients concerning different variables such as age, gender, residence, BMI, lifestyle, duration of illness, carbonated drink user and serum ferritin level evaluated and shows that no statistically significant difference of Plummer Vinson syndrome patients concerning age (*p-value*: 0.077), gender (*p-value*: 0.054), residence (*p-value*: 0.357) and duration of illness (*p-value* 0.663) (Table 2). While distribution concerning serum ferritin level (*p-value* <0.001), lifestyle (*p-value* 0.003), BMI (*p-value* 0.015) and carbonated drink user (*p-value* 0.008) shows a statistically significant difference between subgroups (Table 2).

4. Discussion

PVS represents a precancerous state. The optimum metric for identifying iron-deficient anaemia should be serum ferritin. To stop the spread of cancer, routine monitoring is necessary. The explanation is that anaemia causes epithelial atrophy, which impairs the mucosa's ability to heal. This, in turn, permits carcinogens and cocarcinogens to act aggressively, increasing the risk of cancer across the esophagus and oral cavity. The simple and efficient treatment for Plummer-Vinson syndrome is

iron supplementation combined with mechanical dilatation.^{7,8}

Of the total 203 study subjects in our study presenting with dysphagia, Plummer-Vinson Syndrome was diagnosed in 22(10.8%) study subjects while low serum ferritin level was found in 35(17.2%) subjects. Among all patients diagnosed with Plummer-Vinson syndrome, low serum ferritin was found in 18(81.81%) subjects showing that the frequency of low serum ferritin is much higher in patients with Plummer-Vinson syndrome, so it can be a useful marker for early diagnosis of Plummer Vinson syndrome. Among all patients diagnosed as having Plummer-Vinson syndrome, 18(81.81%) had a history of carbonated drink use, 19(86.36%) had a history of a sedentary lifestyle, 19(86.36%) were having BMI ≤30kg/m² and 17(77.27%) were having a duration of illness ≤6months. Distribution of Plummer Vinson syndrome patients concerning different variables such as age, gender, residence, BMI, lifestyle, duration of illness, carbonated drink user and serum ferritin level evaluated and shows that no statistically significant difference of Plummer Vinson syndrome patients concerning age (*p-value*: 0.077), gender (*p-value*: 0.054), residence (*p-value*: 0.357) and duration of illness (*p-value* 0.663) (Table 2). While distribution concerning serum ferritin level (*p-value* <0.001), lifestyle (*p-value* 0.003), BMI (*p-value* 0.015) and carbonated drink user (*p-value* 0.008) shows a statistically significant difference between subgroups (Table 2).

A case study conducted by Patel K. et al on a female with Plummer-Vinson syndrome found a mean serum ferritin level of 6ng/ml.¹⁰ Another case study conducted by Harmouch F et al demonstrated severe iron deficiency in a female diagnosed with Plummer Vinson Syndrome.¹¹ Another case study reported by Asaad A et al demonstrated that Plummer Vinson syndrome is a precancerous condition and prompt diagnosis is essential in the management of these patients and iron therapy is considered as a cornerstone in treating the condition.¹² A study conducted by Karthikeyan P demonstrated the prevalence of Plummer Vinson syndrome in patients presenting with dysphagia and they found 40(14.98%) subjects diagnosed with Plummer Vinson syndrome among all 267 subjects presenting with dysphagia. Age distribution of study subjects showed that 10% of individuals were less than 30 years of age in contrast to our study findings, in which we have found 21.7% less than 30 years of age.⁶ Another study conducted by Hirose T et al found that most of the patients were found

fourth to sixth decade of life as the condition is common in this age group.¹³ Atmatzidis K et al in their study found low serum ferritin levels in Plummer Vinson syndrome and the findings are consistent with our study findings.¹⁴

The studies conducted by other researchers showed that 66.6% of the patients had low serum ferritin levels and these findings are consistent with our study findings. Many research studies correlate with our study and serum ferritin is considered as a preferred marker to diagnose iron deficiency in Plummer Vinson syndrome.¹⁵ Plummer-Vinson Syndrome can strike those who have chronic iron deficiency anaemia over an extended period. Plummer-Vinson syndrome has an enigmatic cause. Nutrient deficiencies, or the absence of specific nutrients, may have an impact, as well as genetic variables. Testing should be done to check for iron deficiency or anaemia. Taking iron supplements could help with swallowing issues.¹⁶⁻¹⁸

Based on previous literature searches, very limited data is available regarding the evaluation of serum ferritin levels in patients with Plummer-Vinson Syndrome.

5. Conclusion

Based on our study, it is concluded that serum ferritin level can be a useful marker in patients with Plummer-Vinson syndrome with a very high prevalence of low serum ferritin in Plummer-Vinson Syndrome. It can help in the early diagnosis and management of the patients to prevent their malignant transformation.

INSTITUTIONAL REVIEW BOARD

00291116MMANA Dated 30-11-2016

CONFLICTS OF INTEREST- None

Financial support: None to report.

Potential competing interests: None to report

Contributions:

R.T, A.I - Conception of study
- Experimentation/Study Conduction

R.T, A.Q, K.M, M.S -
Analysis/Interpretation/Discussion
A.Q, K.M - Manuscript Writing
R.T, A.I, M.S - Critical Review

All authors approved the final version to be published & agreed to be accountable for all aspects of the work.

References

1. Goel A, Bakshi S, Soni N, Chhavi N. Iron deficiency anemia and Plummer–Vinson syndrome: current insights. *J Blood Med.* 2017; 8:175–84. doi:10.2147/JBM.S127801.
2. Verma S, Mukherjee S. Plummer–Vinson Syndrome. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2024 Jan
3. Kajy M, Monday L, Tannous P. Plummer–Vinson Syndrome with Concomitant Factor VII Deficiency. *Ochsner J.* 2019;19(3):286–9. doi:10.31486/toj.18.0158.
4. Gade AK, Pacheco L. A rare Case of Plummer-Vinson Syndrome. *Cureus J Med Sci.* 2019;11(12): e6463. doi:10.7759/cureus.6463.
5. Goh WGW, Ng DCY, Ng JX, Lim KT. Paterson-Brown Kelly Syndrome (also commonly known as Plummer-Vinson Syndrome). *ClinCase Rep.* 2020; 8:2316–2317. <https://doi.org/10.1002/CCR3.3127>
6. Karthikeyan P, Rasmika K. Serum ferritin: A hidden gem for diagnosing plummer vinson syndrome. *IP J Otorhinolaryngol Allied Sci* 2022;4(4):130-133. DOI: 10.18231/j.ijoas.2021.026
7. Lo KB, Albano J, Sandhu N, Candelario N. Plummer–Vinson syndrome: improving outcomes with a multidisciplinary approach. *J Multidiscip Healthc.* 2019; 12:471–7. doi:10.2147/JMDH.S180410.
8. Liu CC, Lin YS, Syndrome PV. Ear Nose Throat J. 2019;98(5):259–60. <https://doi.org/10.1177/0145561319850412>
9. Hussin A, Din IU, Arif A, Shah SM, Hafeez M. Plummer Vinson syndrome in patients presenting with dysphagia. *J Med Sci.* 2017; 25(1): 24–6
10. Patel K, Kassir M, Patel M, Eichorn W. Plummer–Vinson Syndrome in an African-American Woman. *Case Rep Gastroenterol.* 2021 Jun 22;15(2):557–561. doi: 10.1159/000516937
11. Harmouch F, Liaquat H, Chaput KJ, Geme B. Plummer–Vinson Syndrome: A Rare Cause of Dysphagia in an Octogenarian. *Am J Case Rep.* 2021 Apr 24;22: e929899. doi: 10.12659/AJCR.929899.
12. Asaad A, Jamal R. A Case of Plummer-Vinson Syndrome in an Omani Woman. *Cureus.* 2023 Jun 27;15(6): e41050. doi: 10.7759/cureus.41050
13. Hirose T, Funasaka K, Furukawa K. Plummer–Vinson syndrome with esophageal web formation in which detailed endoscopic images were obtained. *Intern Med.* 2019 Mar 15. 58(6):785–9. <https://doi.org/10.2169/internalmedicine.1628-18>
14. Atmatzidis K, Papaziogas B, Pavlidis T, Mirelis Ch, Papaziogas T. Plummer–Vinson syndrome. *Dis Esophagus.* 2003;16(2):154–7. doi: 10.1046/j.1442-2050.2003.00316
15. Guyatt GH, Oxman AD, Ali M, Willan A, McIlroy W, Patterson C. Laboratory diagnosis of iron-deficiency anemia: an overview. *J Gen Intern Med.* 1992 Mar-Apr;7(2):145–53. doi: 10.1007/BF02598003
16. Hammad H, Wani S. Esophageal tumors. In: Feldman M, Friedman LS, Brandt LJ, eds. *Sleisenger and Fordtran's Gastrointestinal and Liver Disease.* 11th ed. Philadelphia, PA: Elsevier; 2021: chap 48.
17. Kavitt RT, Vaezi MF, Flint PW, Francis HW, Haughey BH, et al. Diseases of the esophagus *Cummings Otolaryngology: Head and Neck Surgery.* 7th ed. Philadelphia, PA: Elsevier; 2021: chap 68
18. Rustgi AK, Goldman L, Schaefer AI. Neoplasms of the esophagus and stomach. *Goldman-Cecil Medicine.* 26th ed. Philadelphia, PA: Elsevier; 2020: chap 183. <https://doi.org/10.1016/b978-1-4557-1604-7.00198-6>