Original Article
DOI: https://doi.org/10.70749/ijbr.v3i6.2189

INDUS JOURNAL OF BIOSCIENCE RESEARCH
https://ijbr.com.pk
ISSN: 2960-2793/ 2960-2807

# Co Incidence of Microcytic Anemia with other Chronic Diseases like Diabetes, Hypertension and Ischemic Heart Disease in Patients at PAF Hospital Islamabad

**Aqsa Hameed[1], Farrukh Zahra[1], Bilal Hameed[1], Tajwar Gul[1], Muhammad Haseeb Tariq[1], Nimra Muneer Khan[1]**

[1]Department of Medicine, Pakistan Airforce Hospital, Islamabad, Pakistan

## ARTICLE INFO

**Keywords:** Microcytic anemia, Diabetes mellitus, Hypertension, Ischemic heart disease.

**Correspondence to:** Aqsa Hameed, Department of Medicine, Pakistan Airforce Hospital, Islamabad, Pakistan.
Email: axa_chaudhary069@yahoo.com

**Declaration**
**Authors' Contribution:** All authors equally contributed to the study and approved the final manuscript.

**Conflict of Interest:** No conflict of interest.

**Funding:** No funding received by the authors.

**Article History**
Received: 21-02-2025 Revised: 08-06-2025
Accepted: 20-06-2025 Published: 30-06-2025

## ABSTRACT

**Background:** Microcytic anemia is a frequent hematological disorder that frequently accompanies chronic non-communicable diseases and may exacerbate morbidity and affect the progression of these diseases. Although clinically important, little local information is available regarding the prevalence of microcytic anemia in diabetes mellitus, hypertension, and ischemic heart disease patients. **Objective:** To determine the frequency and association of microcytic anemia with diabetes mellitus, hypertension, and ischemic heart disease in adult patients. **Study Design:** Descriptive cross-sectional study. **Duration and Place of Study:** The study was conducted from August 2024 to January 2025 at the Department of Medicine, PAF Hospital, Islamabad. **Methodology:** A total of 252 adult patients with confirmed diagnoses of diabetes mellitus, hypertension, or ischemic heart disease were enrolled. Exclusion criteria included other known causes of anemia, recent transfusion, hematological malignancies, and advanced liver disease. Data collection involved demographic details, medical history, clinical records, and laboratory investigations. Microcytic anemia was defined according to World Health Organization criteria using mean corpuscular volume and hemoglobin levels. **Results:** The mean age of participants was 55.67 ± 10.97 years, with 135 males (53.6%) and 117 females (46.4%). Overall, 110 patients (43.7%) had microcytic anemia. Among diabetics, anemia was present in 63 (44.1%) versus 47 (43.1%) in non-diabetics (p=0.882). In hypertensive patients, anemia was significantly more frequent (75, 52.1%) compared to non-hypertensives (35, 32.4%) (p=0.002). In ischemic heart disease, anemia was found in 33 (50.8%) compared to 77 (41.2%) without the disease (p=0.179). Correlation analysis showed hypertension duration had significant negative correlations with hemoglobin ($r=-0.137$, $p<0.05$) and mean corpuscular volume ($r=-0.223$, $p<0.01$). **Conclusion:** Microcytic anemia is common among patients with chronic diseases, with hypertension showing a significant association.

## INTRODUCTION

Most commonly secondary to iron deficiency or chronic inflammation, microcytic anemia has been well-described to be associated with diabetes mellitus. Anemia, and iron deficient anemia (IDA) in its stead, can complicate glycemic control by virtue of the influence of red blood cell turnover in the determination of the values for hemoglobin A1c (HbA1c).[1,2] Iron deficiency per se can make worse the fatigue, lower the exercise tolerance, and have negative effects in general metabolic control in diabetes.[2] Chronic hyperglycemia, a feature in diabetes, can also diminish the effect of erythropoiesis and twist iron metabolism to cause the production of anemia in this group.[1] The bidirectional interaction then infers that anemia can adversely hamper the outcomes in diabetes, while diabetes has the tendency to make subjects prone to chronic states of microcytosis.[3] High prevalence of anemia has been found in diabetes subjects, and the results in systematic reviews have been to highlight the important effects on the outcomes in health.[3,4] The effect of IDA on the levels of HbA1c concentrations in diabetes subjects has been the subject of significant study, in so far as some have revealed raised concentrations in IDA subjects, normalization thereafter after the administration of iron preparations.[2] As such, iron status has to be carefully considered for the proper diagnosis and control in diabetes.

The simultaneous existence of microcytic anemia and hypertension has important clinical relevance, inasmuch as anemia can magnify cardiovascular burden in the hypertensive individual.[5] Reduced hemoglobin levels diminish oxygen delivery to the tissues, triggering



Copyright © 2025. IJBR Published by Indus Publishers
This work is licensed under a Creative Commons Attribution 4.0 International License.

compensatory cardiovascular response in the form of enhanced cardiac output and enhanced myocardial workload. Such physiological alterations can predispose to increased end-organ damage in the individual who is hypertensive.[5] Chronic iron deficiency has been implicated in vascular impairment and enhanced oxidative burden, processes that can diminish the efficacy of blood pressure control.[6] Patients who experience hypertension and microcytic anemia concurrently typically complain of worse diseases, including severe weakness and diminished exercise tolerance, and will require holistic strategies in care.[5] Research has identified high prevalence rates for anemia in the hypertensive individual, affirming the value to be attained in anemia screening and control in the group.[5] The multifaceted interaction within iron metabolism and cardiovascular well-being serves to affirm the benefit in holistic strategies in the care for individuals.[6]

In subjects with ischemic heart disease (IHD), the added complication of microcytic anemia provides considerable danger by restricting oxygen delivery to previously damaged myocardial tissue.[7] Anemia has the potential to raise ischemic burden, accelerate symptom progression at an enhanced rate, as well as generate adverse clinical end-points, including increased rates of in-hospital admission and mortality.[7,8] Microcytic states, and in specific those triggered by iron deficiency, can also impede endothelial performance and enhance thrombogenic capacity, thereby contributing to pre-existing myocardial ischemic pathophysiology.[7,9] For the sake of these cross-considerations, the prompt diagnosis and remediation of microcytic anemia are imperative for the maximal support of cardiac output and improved prognosis in subjects suffering from IHD.[10] Clinical studies have invariable demonstrated the adverse prognostic importance of anemia in the context of the acute coronary syndromes, attributing its independent association to adverse end-points.[11] The influence of iron deficiency on myocardial reperfusion and subsequent overall end-points in the context of the acute myocardial infarct thus serves to indicate the substantial need for its diagnosis and remediation.[12]

Lanser L et al. observed a prevalence of 45.4% in individuals with hypertension and 23.2% in those with diabetes.[13] Dhungel S et al. reported that the prevalence of microcytic anemia was 21% among patients with ischemic heart disease.[14]

For Pakistan, the occurrence of microcytic anemia alongside the chronic diseases like diabetes, hypertension, and ischemic heart disease is still inadequately researched despite their extensive prevalence among the population. Sparse data preclude a distinct comprehension of overlapping illness burden and clinical significance, which may provoke greater morbidity and complex management. Carrying out this research will offer locally applicable evidence to inform early detection, collaborative care, and enhanced patient outcomes.

## METHODOLOGY

This descriptive cross-sectional investigation was carried out in the Department of Medicine at PAF Hospital, Islamabad, between August 2024 and January 2025. Approval for the study was obtained from the institutional review board prior to data collection. A total of 252 participants were enrolled, the sample size having been calculated with the WHO software, using a 95% confidence interval, a 5% margin of error, and an estimated prevalence of microcytic anemia of 21% among patients with ischemic heart disease.[13]

Eligible participants were adults aged 18 years or older, of either sex, who had a confirmed diagnosis of diabetes mellitus, hypertension, or ischemic heart disease, whether occurring individually or in combination, and who had complete laboratory records including complete blood count with mean corpuscular volume. Individuals were not included if they had other recognized causes of anemia such as megaloblastic anemia, hemolytic anemia, or anemia due to renal failure without microcytic features. Patients with recent acute blood loss or transfusion within the preceding three months, hematological malignancies, or advanced liver disease were also excluded. Written informed consent was obtained from all participants prior to enrollment.

Demographic characteristics such as age and gender were documented, followed by a detailed medical history concerning diabetes, hypertension, and ischemic heart disease. Clinical records, laboratory investigations, and prior diagnostic reports were used to confirm the chronic disease status. Physical examination findings and baseline parameters were noted from medical files. Microcytic anemia was defined as the presence of a mean corpuscular volume below 80 femtoliters together with hemoglobin levels below 13 g/dL in males and below 12 g/dL in females, consistent with the World Health Organization criteria. Diabetes mellitus was identified either by fasting plasma glucose of 126 mg/dL or higher, HbA1c of at least 6.5%, random glucose of 200 mg/dL or more with symptoms, or the use of hypoglycemic agents. Hypertension was defined by sustained blood pressure readings of at least 140/90 mmHg on two separate measurements or ongoing treatment with antihypertensive drugs. Ischemic heart disease was established through clinical history of angina, prior myocardial infarction, electrocardiographic evidence, positive stress testing, or documentation of coronary artery disease on angiography or imaging studies.

Data were analyzed using SPSS version 29. Continuous variables were described as mean values with standard deviations, while categorical variables were summarized as frequencies and percentages. The association between microcytic anemia and chronic diseases was assessed through Chi-square testing, with a significance threshold set at a p-value of less than 0.05.

## RESULTS

Patient demographics revealed a mean age of 55.67±10.97 years, with disease duration parameters showing diabetes mellitus duration of 7.65±7.95 years, hypertension duration of 7.67±8.97 years, and ischemic heart disease duration of 2.06±4.13 years. Hematological parameters demonstrated hemoglobin levels of 12.26±1.49 g/dL, mean corpuscular volume of 80.93±6.22 fL, red blood cell count of 4.70±0.46 $\times 10^{12}$/L, and hematocrit of 39.89±4.99%. Gender distribution showed 135 males (53.6%) and 117 females (46.4%). Among chronic


Copyright © 2025. IJBR Published by Indus Publishers
This work is licensed under a Creative Commons Attribution 4.0 International License.

diseases, diabetes mellitus was present in 143 patients (56.7%) versus 109 patients (43.3%) without diabetes, hypertension was observed in 144 patients (57.1%) compared to 108 patients (42.9%) without hypertension, and ischemic heart disease affected 65 patients (25.8%) while 187 patients (74.2%) were free of this condition (as shown in Table 1).

**Table 1**
*Patient Demographics*

| Demographics | | Mean ± SD |
|---|---|---|
| Age (years) | | 55.67±10.97 |
| DM Duration (years) | | 7.65±7.95 |
| HTN Duration (years) | | 7.67±8.97 |
| IHD Duration (years) | | 2.06±4.13 |
| Hemoglobin (g/dL) | | 12.26±1.49 |
| MCV (fL) | | 80.93±6.22 |
| RBC ($\times 10^{12}$/L) | | 4.70±0.46 |
| Hematocrit (%) | | 39.89±4.99 |
| Gender | Male n (%) | 135 (53.6%) |
| | Female n (%) | 117 (46.4%) |
| Diabetes Mellitus | Yes n (%) | 143 (56.7%) |
| | No n (%) | 109 (43.3%) |
| Hypertension | Yes n (%) | 144 (57.1%) |
| | No n (%) | 108 (42.9%) |
| Ischemic Heart Disease | Yes n (%) | 65 (25.8%) |
| | No n (%) | 187 (74.2%) |

The frequency analysis of microcytic anemia revealed that 110 patients (43.70%) had microcytic anemia while 142 patients (56.30%) did not have this condition, representing the total study population of 252 patients (as shown in Table 2).

**Table 2**
*Frequency of Microcytic Anemia Among Patients with Chronic Diseases*

| Microcytic Anemia | Frequency | % age |
|---|---|---|
| Yes | 110 | 43.70% |
| No | 142 | 56.30% |
| Total | 252 | 100% |

Association analysis between microcytic anemia and chronic diseases demonstrated that among patients with diabetes mellitus, 63 (44.1%) had microcytic anemia and 80 (55.9%) did not, while among non-diabetic patients, 47 (43.1%) had microcytic anemia and 62 (56.9%) did not, showing no significant association (p=0.882). For hypertension, 75 patients (52.1%) with hypertension had microcytic anemia compared to 69 (47.9%) without anemia, while among non-hypertensive patients, 35 (32.4%) had microcytic anemia and 73 (67.6%) did not, demonstrating a statistically significant association (p=0.002). Regarding ischemic heart disease, 33 patients (50.8%) with IHD had microcytic anemia versus 32 (49.2%) without anemia, while among patients without IHD, 77 (41.2%) had microcytic anemia and 110 (58.8%) did not, showing no significant association (p=0.179) (as shown in Table 3).

**Table 3**
*Association of Microcytic Anemia with Chronic Diseases*

| Chronic Diseases | | Microcytic Anemia | | p-value |
|---|---|---|---|---|
| | | Yes n(%) | No n(%) | |
| Diabetes Mellitus | Yes | 63 (44.1%) | 80 (55.9%) | 0.882* |
| | No | 47 (43.1%) | 62 (56.9%) | |
| Hypertension | Yes | 75 (52.1%) | 69 (47.9%) | 0.002* |
| | No | 35 (32.4%) | 73 (67.6%) | |
| Ischemic Heart Disease | Yes | 33 (50.8%) | 32 (49.2%) | 0.179* |
| | No | 77 (41.2%) | 110 (58.8%) | |

*Chi-square Test

Correlation analysis between chronic disease durations and hematological parameters revealed that diabetes mellitus duration showed a positive non-significant correlation with hemoglobin (+0.089), a positive non-significant correlation with MCV (+0.087), a significant negative correlation with RBC count (-0.203, p<0.01), and a negative non-significant correlation with hematocrit (-0.106). Hypertension duration demonstrated a significant negative correlation with hemoglobin (-0.137, p<0.05), a significant negative correlation with MCV (-0.223, p<0.01), a positive non-significant correlation with RBC count (+0.082), and a negative non-significant correlation with hematocrit (-0.035). Ischemic heart disease duration showed a negative non-significant correlation with hemoglobin (-0.040), a significant negative correlation with MCV (-0.149, p<0.05), a significant positive correlation with RBC count (+0.204, p<0.01), and a positive non-significant correlation with hematocrit (+0.109) (as shown in Table 4).

**Table 4**
*Correlation of Chronic Disease Durations with Hematological Parameters*

| Variable | Hb (g/dl) | MCV (fL) | RBC ($\times 10^6$/µL) | HCT (%) |
|---|---|---|---|---|
| DM Duration (years) | +0.089 (NS) | +0.087 (NS) | −0.203** | −0.106 (NS) |
| HTN Duration (years) | −0.137* | −0.223** | +0.082 (NS) | −0.035 (NS) |
| IHD Duration (years) | −0.040 (NS) | −0.149* | +0.204** | +0.109 (NS) |

**Notes:**
- *Correlation is significant at the 0.05 level (2-tailed).
- **Correlation is significant at the 0.01 level (2-tailed).
- NS = Not significant.

## DISCUSSION

The results show a strong correlation of hypertension with microcytic anemia (p=0.002), whereas diabetes mellitus and ischemic heart disease had no significant associations with the occurrence of microcytic anemia. The strong correlation of hypertension with microcytic anemia may result from various pathophysiologic mechanisms. Long-standing hypertension causes increased vascular resistance and endothelial dysfunction and hence may affect absorption and utilization pathways of iron. Also, hypertensive individuals usually have a chronic low-grade inflammatory condition, which may cause sequestration of iron in macrophages and will decrease its availability to erythropoiesis and lead to an anemia of the iron deficiency type with typical microcytic morphology. Activation of the renin-angiotensin-aldosterone system in hypertension may cause changes in mineral metabolism and disruption


Copyright © 2025. IJBR Published by Indus Publishers
This work is licensed under a Creative Commons Attribution 4.0 International License.

of iron homeostasis.

The absence of a significant association of diabetes mellitus and microcytic anemia, despite a high prevalence of diabetes in the study group, suggests that diabetic complications primarily impact other components of hematopoiesis. Diabetic patients typically acquire normocytic anemia from mechanisms entailing deficiency of erythropoietin due to diabetic nephropathy, chronic inflammation, and inhibition of the bone marrow, but do not impact iron metabolism directly. Absence of an association with ischemic heart disease may indicate atherosclerotic processes primarily responsible for coronary ischemia and not systemic metabolic disturbances directly impacting iron metabolism and red cell shape. Correlation analysis indicated that duration of hypertension exhibited the most significant negative correlation with mean corpuscular volume, suggesting longer exposure to hypertensive pathophysiologic states increasing microcytic changes progressively, most likely through cumulative effects involving iron metabolism and continuing inflammatory processes. Our study population of 252 adults with a mean age of 55.67 ± 10.97 years and a balanced male predominance (53.6 %) mirrors the age-sex structure seen in the Dhungel C, et al. cohort (mean age 67.7 years, 63.6 % female) [14] and the Barbieri C, et al. sample (mean age 60.9 years, 65.8 % female).[15] Microcytic anemia was identified in 43.7 % of our participants, a figure that sits between the 29.1 % microcytic fraction reported by Tegene C, et al. in Ethiopian HF patients.[16] The slightly lower prevalence in our setting may reflect the inclusion of a broader spectrum of chronic diseases rather than heart-failure-selected cohorts.

Diabetes was present in 56.7 % of our subjects, and within this subgroup 44.1 % exhibited microcytic anemia, a rate comparable to the 34.2 % anemia prevalence described by Barbieri C, et al. in DM2 patients.[15] Like Barbieri C, et al. we found no significant difference in microcytic anemia frequency between diabetic and non-diabetic subjects ($p = 0.882$ vs $p = 0.753$ in Barbieri), supporting the view that diabetes itself does not confer an additional microcytic risk beyond the chronic inflammatory milieu common to both groups. Hypertension, present in 57.1 % of our cohort, showed a striking association with microcytic anemia (52.1 % vs 32.4 % in non-hypertensives, $p = 0.002$). Although ischemic heart disease affected only 25.8 % of our participants, half of them (50.8 %) had microcytic anemia; this approaches the 55.8 % reported by Dhungel C, et al. [14] in recent MI patients, suggesting that acute ischemic events exacerbate iron-restricted erythropoiesis. Correlation analyses revealed that longer hypertension duration was associated with both lower hemoglobin ($r = −0.137$, $p < 0.05$) and smaller MCV ($r = −0.223$, $p < 0.01$), echoing the negative MCV–duration relationship noted by Kumar C, et al. in AOCD secondary to chronic inflammatory states.[17] Conversely, diabetes duration showed a weak negative correlation with RBC count ($r = −0.203$, $p < 0.01$) but not with hemoglobin or MCV, aligning with Barbieri C, et al. who found no correlation between DM duration and hemoglobin levels.[15] Ischemic heart disease duration, although short (2.06 ± 4.13 years), correlated positively with RBC count ($r = +0.204$, $p < 0.01$) but negatively with MCV ($r = −0.149$, $p < 0.05$), a pattern consistent with a transient stress-erythropoietic response superimposed on iron-restricted microcytosis, as described by Tegene C, et al.[16] Taken together, our results reinforce the observations of Kumar C, et al. [17] and Ikram C, et al. [18] that chronic inflammatory disorders—here hypertension and, to a lesser extent, ischemic heart disease—are the principal drivers of microcytic anemia in adults, whereas diabetes alone does not significantly increase microcytic risk once confounders are considered. The slightly lower absolute rates of microcytosis in our mixed chronic-disease cohort, compared with heart-failure-specific studies, likely reflect the heterogeneity of underlying pathophysiologies and milder systemic inflammation.

This work has some limitations. It was a single-center study and the results may not completely generalize to other populations. Cross-sectional design limits causal conclusions on the association of chronic disease duration and microcytic anemia development. Also, confounders like nutritional status, iron studies, and socioeconomic factors could not be included, and these may affect the associations found. Multicenter, longitudinal studies with more comprehensive biochemical profiling are suggested to corroborate and extend these findings

## CONCLUSION

Our research has found that microcytic anemia frequently accompanies chronic ailments and has a strong association in hypertensive patients, although no statistically significant relationship was found with diabetes mellitus and ischemic heart disease. These findings highlight the importance of anemia's active screening and treatment in chronic disease sufferers to enhance general patient care.

### Acknowledgments

We pay our gratitude to healthcare staff for their dedicated efforts, particularly in ensuring accurate documentation and systematic handling of patient information, which greatly supported this work.

## REFERENCES

1. Kuang L, Li W, Xu G, You M, Wu W, Li C. Systematic review and meta-analysis: influence of iron deficiency anemia on blood glycosylated hemoglobin in diabetic patients. Ann Palliat Med. 2021;10(11):11876-11885. https://doi.org/10.21037/apm-21-2944.
2. Shwetha MS, Manu B, Shashidharan P, Deepika T, Kora SA. Effect of iron deficiency anemia on glycosylated hemoglobin levels in non-diabetics: a case control study. Eur J Cardiovasc Med. 2024;14(6):581-586.
3. Mazumder H, Islam KF, Rahman F, Gain EP, Saha N, Eva IS, et al. Prevalence of anemia in diabetes mellitus in South Asia: a systematic review and meta-analysis. PLoS One. 2023;18(5):e0285336 https://doi.org/10.1371/journal.pone.0285336.
4. Subramaniam SK, Umashankar R, Vinatha MC, Raj A, The K, Keerthana I, et al. Prevalence of nutritional anaemia in type 2 diabetes mellitus in the absence of renal impairment. Cureus. 2024;16(11):e72946. https://doi.org/10.7759/cureus.72946.



Copyright © 2025. IJBR Published by Indus Publishers
This work is licensed under a Creative Commons Attribution 4.0 International License.

5. Gela YY, Belay DG, Chilot D, Andualem AA, Bitew DA, Sinamaw D, et al. Prevalence of anemia and associated factors among adult hypertensive patients in referral hospitals, Amhara Regional State. Sci Rep. 2023;13(1):14329. https://doi.org/10.1038/s9999-023-41553-z.
6. Sawicki KT, De Jesus A, Ardehali H. Iron metabolism in cardiovascular disease: physiology, mechanisms, and therapeutic targets. Circ Res. 2023;132(3):328-347. https://doi.org/10.1161/CIRCRESAHA.122.321667.
7. Zeidman A, Fradin Z, Blecher A, Oster HS, Avrahami Y, Mittelman M. Anemia as a risk factor for ischemic heart disease. Isr Med Assoc J. 2004 Jan;6(1):16-8.
8. Fallon J. Iron deficiency and treatment for cardiovascular disease: key points. American College of Cardiology. 2022. https://www.acc.org/Latest-in-Cardiology/ten-points-toremember/2022/11/30/17/14/iron-deficiency-and-cvd
9. Misiewicz A, Badura K, Matuszewska-Brycht O, Krekora J, Drożdż J. Iron deficiency as a factor of worse prognosis in patients with acute myocardial infarction. Biomedicines. 2025;13(4):769. https://doi.org/10.3390/biomedicines13040769.
10. Savarese G, von Haehling S, Butler J, Cleland JG, Ponikowski P, Anker SD. Iron deficiency and cardiovascular disease. Eur Heart J. 2023;44(1):14-29. https://doi.org/10.1093/eurheartj/ehac562241.
11. Stucchi M, Cantoni S, Piccinelli E, Somaschini A, Senni M. Anemia and acute coronary syndrome: current perspectives. Vasc Health Risk Manag. 2018;14:157-167. https://doi.org/10.2147/VHRM.S140951.
12. Yetman D. Anemia and hypertension: can one lead to the other? Healthline. 2025. https://www.healthline.com/health/anemia-with-hypertension
13. Lanser L, Fuchs D, Scharnagl H, Grammer T, Kleber ME, Marz W, et al. Anemia of chronic disease in patients with cardiovascular disease. Front Cardiovasc Med. 2021;8:666638. https://doi.org/10.3389/fcvm.2021.666638.
14. Dhungel S, Gautam S, KC B, Khan M, Shakya A, Bhattarai P, et al. Pattern of anemia in patients with heart failure in ischemic heart disease. JNHLS. 2024;3(2):63-68.
15. Barbieri J, Fontela PC, Winkelmann ER, et al. Anemia in patients with type 2 diabetes mellitus. Anemia. 2015;2015:354737. https://doi.org/10.1155/2015/354737.
16. Tegene E, Mohammed A, Godebo T, et al. Prevalence of anemia and associated factors in patients with heart failure admitted to Jimma University Medical Center. BMC Cardiovasc Disord. 2025;25:253. https://doi.org/10.1186/s12872-025-04714-8.
17. Kumar M, Pankaj SK, Mishra A, Jaiswal CP. A hospital-based study to determine the specific aetiology of microcytic anemia. Int J Curr Pharm Rev Res. 2024;16(4):584-590.
18. Ikram N, Baqai HZ, Hassan K. Anemia of chronic diseases. J Islamabad Med Dent Coll. 2012;2:89-92.


Copyright © 2025. IJBR Published by Indus Publishers
This work is licensed under a Creative Commons Attribution 4.0 International License.