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ORIGINAL ARTICLE

Association between Socioeconomic status and delay in seeking care for diabetes mellitus.

Faryal Waheed[1], Wajahat Hussain[2], Summaira Hassan[3], Qudsia Anwer[4], Faseeh Abid[5], Muhammad Ahmed[6]

ABSTRACT… Objective: To examine associations between SES indicators and patient delay duration prior to type 2 diabetes mellitus diagnosis. **Study Design:** Analytical Cross Sectional study. **Setting:** Bahawal Victoria Hospital/Quaid-e-Azam Medical College, Bahawalpur. **Period:** June to December 2025. **Methods:** Total 274 adults with physician confirmed type 2 diabetes diagnosed within prior 6–12 months were included. Patient delay was defined as days from symptom recognition to first healthcare consultation (≥30 days=substantial delay). SES was assessed via household income (tertiles), education, occupation, and asset-based wealth index. Multivariable logistic regression adjusted for demographic, clinical and health system factors; stratified analyses explored effect modification. **Results:** Median patient delay was 28 days (IQR:14–52). A pronounced socioeconomic gradient existed: 64.1% of low-SES participants experienced delay ≥30 days versus 26.4% of high-SES ($p<0.001$). After adjustment, low income (aOR=2.84, 95% CI: 1.49–5.42) and minimal education (aOR=2.31, 95% CI: 1.22–4.38) independently predicted delay. Associations were stronger among women (aOR=4.12) than men (aOR=2.18; $p=0.038$) and in rural (aOR=3.67) versus urban settings (aOR=1.94; $p=0.047$). Financial constraints and agricultural labor demands predominated as barriers for disadvantaged groups. **Conclusion:** Socioeconomic disadvantage substantially prolongs patient delay in diabetes diagnosis with compounded vulnerabilities for women and rural populations. Multilevel interventions financial protection for outpatient services, gender-sensitive community outreach, transportation support and context-specific health education are urgently required to mitigate diagnostic delays and prevent complications.

Key words: Gender Disparities, Patient Delay, Rural Health, Socioeconomic Status, Type 2 Diabetes.

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INTRODUCTION

With an estimated 529 million people living with diabetes mellitus (DM) in 2021, the disease burden is still rising, especially in developing countries, where 87.5% of undiagnosed diabetes cases reside, creating a significant reservoir of untreated disease.[1,2] Delayed diagnosis and subsequent care seeking behavior significantly amplify this burden, as people who delay medical consultation after symptom recognition face significantly elevated risks of acute complications, such as diabetic ketoacidosis (DKA) and irreversible micro-vascular damage.[3] Socioeconomic status (SES) is shown as the strongest predictor of DKA presentation at diagnosis.[4]

Precise operational differentiation between patient and system delays is necessary for the diagnostic delay.[5] The term "patient delay" particularly describes the time that passes between a person's identification of symptoms associated with diabetes (such as polyuria, polydipsia, or unexplained weight loss) and their interaction with a healthcare professional.[6] System delay, on the other hand, includes the time between the initial medical encounter and the final diagnosis and the start of the proper course of treatment.[7] Through interrelated categories such as income, occupation, educational achievement and acquired wealth/assets, socioeconomic status serves as a multifaceted construct that reflects a person's or household's place within societal hierarchies.[8] A systematic investigation revealed that socioeconomic disadvantage is a more powerful predictor of poorly controlled diabetes than clinical characteristics such as body mass index, age, or the duration of diabetes.[9]

1. MBBS, FCPS, Assistant Professor Community Medicine, Quaid-e-Azam Medical College, Bahawalpur.
2. MBBS, MPH, FCPS, Assistant Professor Community Medicine, Quaid-e-Azam Medical College, Bahawalpur.
3. MBBS, FCPS, Professor Community Medicine, Quaid-e-Azam Medical College, Bahawalpur.
4. MBBS, FCPS, Assistant Professor Community Medicine, Quaid-e-Azam Medical College, Bahawalpur.
5. MBBS, Senior Demonstrator Community Medicine, Quaid-e-Azam Medical College, Bahawalpur.
6. MBBS, House Officer, Bahawal Victoria Hospital/Quaid-e-Azam Medical College, Bahawalpur.

Correspondence Address:
Dr. Wajahat Hussain
Community Medicine, Quaid-e-Azam Medical College, Bahawalpur.
wajahatbukhari986@gmail.com

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Critical knowledge gaps remain regarding SES correlations with the initial treatment seeking phase before to diagnosis, despite data relating SES to diabetes outcomes after diagnosis. Current research focuses on complication management, medication adherence, or healthcare consumption in individuals that have already received a diagnosis, ignoring the critical pre-diagnosis phase when decisions to seek treatment and recognize symptoms are made.[10]

The synthesis of evidence is further complicated by methodological inconsistencies. Without established measurement techniques, studies operationalize "delay" using a variety of definitions, from arbitrary time cutoffs (e.g. >30 days) to intervals specific to symptoms.[11] Cross-study comparisons and meta-analytic synthesis, which are essential for evidence-based policy decisions, are hampered by this heterogeneity. Furthermore, the bulk of research comes from developed countries with universal or insurance-based healthcare systems, which significantly underrepresents LMIC contexts, where over 80% of the world's diabetes burden is found but diagnostic infrastructure is still inadequate.[12] Catastrophic out of pocket expenses, transportation limitations and conflicting subsistence goals are examples of context-specific obstacles in LMICs that probably produce unique SES delay connections that need for careful research.[13]

Another aspect that has not received enough attention is gender specific associations. In the context of diabetes, gender interacts complexly with SES, even though women typically show higher rates of healthcare consumption than men across illnesses. Due to culturally controlled symptom interpretation, financial dependency limiting autonomous care seeking and gender caregiving duties limiting healthcare access, women from low SES backgrounds may face compounding delays.[15] On the other hand, men may put off getting care because of economic pressures that put earning money ahead of maintaining their health or because masculinity norms discourage asking for help.[16] Few studies have specifically looked at these intersectional dynamics or explored for correlations between gender and socioeconomic status in the delay in seeking diabetic care.

OBJECTIVE

This study aimed to examine association between SES indicators and duration of patient delay before first healthcare consultation for diabetes symptoms.

METHODS

This analytical cross-sectional study was conducted in outpatient department of Bahawal Victoria Hospital/ Quaid-e-Azam Medical College Bahawalpur from June to December 2025 after taking approval from Institutional Ethical Review Committee (Reference No. 5314/DME/QAMC, Bahawalpur Dated 03-03-2025) and informed consent from each patient. Sample size calculated for the study for anticipated delay in seeking care 23%[17] with 95% confidence level and 5% significance level was 274. Eligible participants included adults aged 18 years or older with physician confirmed type 2 diabetes mellitus diagnosed between 6-12 months prior to enrollment, verified through medical record. Individuals with type 1 diabetes mellitus, latent autoimmune diabetes in adults, gestational diabetes or pre-existing type 2 diabetes diagnosed prior to the six-month were excluded.

The patient delay duration was defined as elapsed time in days between an individual's first recognition of at least one diabetes related symptom and their initial consultation with any formally trained healthcare provider. Symptom recognition was operationalized through structured interview incorporating symptom checklist including polyuria, polydipsia, unexplained weight loss exceeding 5% of body weight, persistent fatigue, blurred vision and recurrent skin infections.[18] Delay duration was defined as ≥30 days versus <30 days.

Socioeconomic status was assessed multi-dimensionally through four complementary indicators to capture distinct resource domains influencing healthcare access. Household monthly income was recorded in Pakistani rupees and categorized into tertiles relative to the national poverty line (PKR 33,608 per month for 2024–2025).[19] Educational attainment was documented as the highest completed level (no formal education, primary [grades 1–5], middle [grades 6–8], secondary [grades 9–10], higher secondary [grades 11–12], or tertiary [university degree or higher]).

Occupational classification followed the International Standard Classification of Occupations (ISCO-08) framework, subsequently collapsed into three categories: professional/managerial, skilled/semi-skilled labor, and unskilled labor/agricultural work.[20] A composite wealth index was constructed through principal component analysis of household assets (electricity, sanitation type, drinking water source, cooking fuel, ownership of television, refrigerator, mobile telephone and agricultural landholding) generating quintiles that served as an alternative SES metric.[21]

Demographic characteristics included age, gender, marital status and residential location. Clinical factors comprised symptom severity score (sum of symptom intensity ratings on 5-point Likert scales), body mass index (kg/m^2) categorized per WHO Asian-specific cut-offs, presence of physician-diagnosed hypertension, and family history of diabetes in first-degree relatives. Health system factors included travel time to the nearest healthcare facility (<30 minutes, 30–60 minutes, >60 minutes).[22] Data was entered and analyzed by SPSS version 23.0. Continuous variables were summarized as means with standard deviations or medians with interquartile ranges depending on distribution normality (Shapiro-Wilk test) while categorical variables were presented as frequencies and percentages.

RESULTS

The median age of the participants was 52 years (IQR:45–61) and 156 participants (56.9%) were male. Nearly two-thirds (64.2%) were from rural areas.

Participants were distributed evenly across income based SES tertiles: 92 (33.6%) in the low SES group (monthly household income <PKR 25,000), 91 (33.2%) in the middle SES group (PKR 25,000–45,000) and 91 (33.2%) in high SES group (>PKR 45,000) (Table-I). Low SES participants demonstrated markedly lower educational attainment (76.1% with ≤primary education versus 12.1% in high SES group; p<0.001), higher representation in unskilled agricultural occupations (68.5% versus 4.4%; p<0.001), and substantially longer median travel times to healthcare facilities (55 minutes (IQR: 40–75) versus 22 minutes (IQR: 15–35), p<0.001). Clinical characteristics showed statistically significant differences: low-SES participants presented with higher median symptom severity scores (14 (IQR: 11–17) versus 11 (IQR: 9–14), p=0.003) and greater frequency of hypertension (58.7% versus 41.8%, p=0.021) and body mass index distributions were comparable across groups (p=0.372).

The median patient delay duration was 28 days (IQR: 14–52). Low SES participants experienced significantly longer delays (median 47 days (IQR: 28–78) compared to middle SES (26 days (IQR: 15–45) and high SES participants (16 days (IQR: 9–28), p<0.001. Using the clinically relevant threshold of ≥30 days to define substantial delay, 118 participants (43.1%) met this criterion. The proportion with delay ≥30 days demonstrated a pronounced socioeconomic gradient: 64.1% in the low SES tertile, 38.5% in the middle SES tertile and 26.4% in the high SES tertile (p<0.001; Table-II).

Several significant predictors for delays longer than 30 days were found using unadjusted logistic regression (Table-III). Compared to their high-income counterparts, participants with low household income were at the highest risk (OR 4.92; 95% CI: 2.78–8.71), followed by those in unskilled occupations (OR 4.15; 95% CI: 2.31–7.45) and those living in rural areas (OR 2.37; 95% CI: 1.48–3.81). Despite modest attenuation, the relationship between low SES and treatment delay remained statistically significant even after sequential adjustments were made for health system, clinical, and demographic characteristics. Participants in the lowest income tertile maintained 2.84-fold higher odds of substantial delay compared to the highest tertile (adjusted OR [aOR] 2.84; 95% CI: 1.49–5.42; p=0.001). Similarly, those with no formal education exhibited 2.31-fold higher adjusted odds versus tertiary-educated participants (aOR 2.31; 95% CI: 1.22–4.38; p=0.010). Rural residence remained independently associated with delay after full adjustment (aOR 1.92; 95% CI: 1.14–3.24; p=0.014), whereas travel time >60 minutes lost significance after accounting for residential location and SES.

Stratified analyses revealed important effect modification patterns (Table-IV). The SES-delay association was significantly stronger among women than men (p for interaction=0.038). Low-SES women demonstrated 4.12-fold higher odds of delay ≥30 days compared to high-SES women (aOR 4.12; 95% CI: 1.87–9.08), whereas the corresponding odds ratio for men was 2.18 (95% CI: 1.03–4.62). Residential location also modified the relationship: the income-delay gradient was steeper in rural areas (low versus high income aOR 3.67; 95% CI: 1.72–7.84) than urban settings (aOR 1.94; 95% CI: 0.83–4.55; p for interaction=0.047), suggesting compounded barriers for socioeconomically disadvantaged rural residents.

Self-reported reasons for delaying care seeking varied substantially by SES (Table 5). Financial constraints predominated among low SES participants (73.9% cited "inability to afford consultation fees or medications" versus 18.7% in high SES group; p<0.001). Competing household priorities particularly agricultural labor demands during harvest seasons were reported by 58.7% of low-SES versus 14.3% of high SES participants (p<0.001). In contrast, high SES participants more frequently attributed delay to symptom misinterpretation ("thought symptoms were temporary or due to aging"; 47.3% versus 22.8% in low SES; p<0.001) or reliance on initial self-management with over the counter remedies (35.2% versus 15.2%; p=0.002). Transportation barriers were universally reported across SES groups in rural areas (>80%), though low SES rural residents more often described complete absence of affordable transport options versus temporary unavailability cited by higher SES counterparts.

DISCUSSION

This study demonstrates a pronounced socioeconomic gradient in patient initiated delays preceding diabetes diagnosis among adults in southern Punjab, Pakistan. Delays of more than 30 days between symptom awareness and medical consultation were encountered by two-thirds of people with low socioeconomic status, more than twice as many as those with higher socioeconomic status. Participants in the lowest income tertile maintained about three times greater chances of significant delay compared to those in the highest tertile after adjusting for demographic, clinical and health system characteristics, highlighting the impact of SES on treatment seeking behavior.

TABLE-I

Socio-demographic and clinical characteristics of study participants overall and stratified by household income-based socioeconomic status tertiles (n=274)

Characteristic	Total (N=274)	Low SES (<PKR 25,000; n=92)	Middle SES (PKR 25,000–45,000; n=91)	High SES (>PKR 45,000; n=91)	P-Value
Demographics					
Age, median (IQR), years	52 (45–61)	54 (47–63)	51 (44–59)	51 (43–60)	0.183
Male sex, n (%)	156 (56.9)	55 (59.8)	52 (57.1)	49 (53.8)	0.682
Rural residence, n (%)	176 (64.2)	84 (91.3)	58 (63.7)	34 (37.4)	<0.001
Socioeconomic Indicators					
No formal/primary education, n (%)	138 (50.4)	70 (76.1)	48 (52.7)	20 (22.0)	<0.001
Unskilled/agricultural occupation, n (%)	132 (48.2)	63 (68.5)	45 (49.5)	24 (26.4)	<0.001
Travel time to facility >60 min, n (%)	98 (35.8)	58 (63.0)	29 (31.9)	11 (12.1)	<0.001
Clinical Factors					
Symptom severity score†, median (IQR)	13 (10–16)	14 (11–17)	13 (10–16)	11 (9–14)	0.003
BMI ≥25 kg/m², n (%)	198 (72.3)	69 (75.0)	67 (73.6)	62 (68.1)	0.527
Hypertension, n (%)	145 (52.9)	54 (58.7)	49 (53.8)	42 (46.2)	0.021
Family history of diabetes, n (%)	112 (40.9)	32 (34.8)	40 (44.0)	40 (44.0)	0.284

TABLE-II

Distribution of patient delay duration and proportion with substantial delay (≥30 days) across socioeconomic status indicators (n=274)

SES Indicator	Category	n	Delay Duration, Median (IQR), Days	Delay ≥30 Days, n (%)	P-Value
Household income	Low (<PKR 25,000)	92	47 (28–78)	59 (64.1)	<0.001
	Middle (PKR 25,000–45,000)	91	26 (15–45)	35 (38.5)	
	High (>PKR 45,000)	91	16 (9–28)	24 (26.4)	
Education level	No formal/primary	138	38 (22–65)	76 (55.1)	<0.001
	Secondary	89	24 (13–42)	32 (36.0)	
	Tertiary	47	15 (8–25)	10 (21.3)	
Occupation	Unskilled/agricultural	132	42 (25–70)	78 (59.1)	<0.001
	Skilled/semi-skilled	98	22 (12–38)	31 (31.6)	
	Professional/managerial	44	14 (8–24)	9 (20.5)	
Wealth index quintile	Lowest	55	52 (32–85)	41 (74.5)	<0.001
	Middle	109	28 (16–48)	49 (45.0)	
	Highest	110	17 (10–30)	28 (25.5)	

TABLE-III

Factors associated with delay in seeking care ≥30 days: unadjusted and adjusted logistic regression analyses (n=274)

Variable	Category	Unadjusted OR (95% CI)	P-Value	Adjusted OR (95% CI)	P-Value
Household income	High (>PKR 45,000)	Reference	—	Reference	—
	Middle (PKR 25,000–45,000)	1.75 (0.96–3.19)	0.068	1.48 (0.77–2.84)	0.238
	Low (<PKR 25,000)	4.92 (2.78–8.71)	<0.001	2.84 (1.49–5.42)	0.001
Education level	Tertiary	Reference	—	Reference	—
	Secondary	2.08 (0.95–4.56)	0.067	1.63 (0.72–3.70)	0.241
	No formal/primary	4.49 (2.12–9.51)	<0.001	2.31 (1.22–4.38)	0.010
Occupation	Professional/managerial	Reference	—	Reference	—
	Skilled/semi-skilled	1.82 (0.80–4.15)	0.154	1.35 (0.56–3.25)	0.498
	Unskilled/agricultural	5.64 (2.58–12.34)	<0.001	2.57 (1.12–5.91)	0.026
Residential location	Urban	Reference	—	Reference	—
	Rural	2.37 (1.48–3.81)	0.014	1.92 (1.14–3.24)	0.014
Travel time to facility	<30 minutes	Reference	—	Reference	—
	30–60 minutes	1.58 (0.92–2.71)	0.098	1.24 (0.69–2.22)	0.471
	>60 minutes	2.41 (1.36–4.27)	0.003	1.48 (0.79–2.78)	0.219
Symptom severity score	Per 5-point increase	1.42 (1.18–1.71)	<0.001	1.28 (1.05–1.57)	0.015

TABLE-IV		
Stratified analysis of association between low household income and delay ≥30 days by gender and residential location (n=274)		
Stratum	**Low vs. high income: adjusted OR (95% CI)**	**p-value**
Overall	2.84 (1.49–5.42)	0.001
Gender		
Women (n=118)	4.12 (1.87–9.08)	<0.001
Men (n=156)	2.18 (1.03–4.62)	0.042
By residential location		
Rural (n=176)	3.67 (1.72–7.84)	0.001
Urban (n=98)	1.94 (0.83–4.55)	0.127

TABLE-V				
Self-reported reasons for delay in seeking care by household income-based socioeconomic status tertiles among participants with delay ≥30 days (n=118)				
Reason for Delay	**Low SES (n=59)**	**Middle SES (n=35)**	**High SES (n=24)**	**P-Value**
Financial barriers				
Unable to afford consultation fees/medications	44 (74.6)	18 (51.4)	5 (20.8)	<0.001
Needed to save money before seeking care	38 (64.4)	15 (42.9)	3 (12.5)	<0.001
Competing priorities				
Agricultural/household labor demands	35 (59.3)	12 (34.3)	2 (8.3)	<0.001
Caregiving responsibilities for family members	28 (47.5)	14 (40.0)	5 (20.8)	0.032
Health perceptions				
Thought symptoms were temporary/aging-related	14 (23.7)	15 (42.9)	11 (45.8)	0.028
Attempted self-management with home remedies	9 (15.3)	12 (34.3)	8 (33.3)	0.035
Access barriers				
No available transportation	42 (71.2)	16 (45.7)	4 (16.7)	<0.001
Facility closed/difficult appointment scheduling	18 (30.5)	14 (40.0)	10 (41.7)	0.184

These results support the idea put out by the Fundamental Cause Theory that socioeconomic resources serve as adaptable assets that allow people to avoid health risks in a variety of illness circumstances and technological periods.[23] While social capital makes navigating disparate healthcare systems easier, financial capital directly influences the ability to put health above subsistence demands in environments with limited resources.[24]

Given that low SES women had four times the odds of delay compared to high SES women, the observed effect modification by gender indicates serious vulnerability among these women. This trend shows interlocking limitations, where sociocultural norms that limit women's independent mobility and reduced autonomy in household financial decision making exacerbate the obstacles already imposed by poverty.[25] Women frequently subordinate their health needs to familial obligations particularly in agricultural households where labor demands intensify during harvest seasons.[26] Geographic isolation exacerbates socioeconomic disadvantage, as evidenced by the steeper income delay gradient in rural compared to urban settings. Low SES residents in rural areas face synergistic barriers of distance, expensive transportation and limited availability, which together obstruct timely care access.[27]

Three-fourths of disadvantaged groups reported not being able to pay for consultations or prescribed drugs consistent with data showing that over 40% of South Asian households have catastrophic out of pocket costs for diabetes care.[28] During crucial harvest seasons when competing demands on agricultural labor further postponed seeking care.[29] Higher SES participants, on the other hand, were more likely to attribute delays to misinterpreting symptoms or trying to manage them on their own using over the counter remedies. This suggests that even though wealthy people can afford to seek timely consultation, health literacy gaps may still prevent them from seeking the right care.[30]

The multidimensional assessment of socioeconomic status using income, education, occupation and asset-based wealth indices addresses criticisms that resource heterogeneity is not sufficiently captured by single indicator techniques.[31] Medical record verification improved outcome validity, while the organized chronology improved recollection accuracy for dates of symptom onset. Regarding SES delay correlations, causal inference is not possible due to the cross-sectional design. Recall bias is still a possibility. The hospital based study might underestimate the true burden of delays among the marginalized by underrepresenting those who never receive formal healthcare.

Rural low-SES women should be given priority for diabetes symptom screening through targeted outreach programs. In order to address the health needs of women, gender-sensitive health education initiatives should involve both men and women in household decision making.

CONCLUSION

Intersections of financial, regional and gender barriers, socioeconomic disadvantage prolongs patient delays prior to diabetes diagnosis. In this high-burden environment, interventions that address gender-equitable resource allocation and material deprivation are required to avoid diagnostic delays.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORSHIP AND CONTRIBUTION DECLARATION	
1	**Faryal Waheed:** Conception of idea, study design, manuscript drafting.
2	**Wajahat Hussain:** Data collection, data analysis.
3	**Summaira Hassan:** Data interpretation.
4	**Qudsia Anwer:** Substantial contribution to data collection.
5	**Faseeh Abid:** Data entry.
6	**Muhammad Ahmed:** Critical revisions.