Age-Specific Prevalence and Determinants of Glycaemic Status Among Women (15–49 Years)

Vikas Kumar Mishra

Population Health and Demographic Analysis

Descriptive Analysis of Blood Glucose Levels

Estimate blood glucose level by background characteristics and test the mean differences between different categories.

Background Characteristics

i. Place of Residence

Table 1: Mean blood glucose level by place of residence

Place of residence	**Mean (mg/dL)**	**SE**	**95% CI**
Urban	113.61	0.24	(113.14, 114.08)
Rural	111.59	0.12	(111.36, 111.82)

According to Table 1, the average blood glucose level in urban dwellers is 113.61 mg/dL, higher than the corresponding value in rural areas, which is 111.59 mg/dL. The absolute difference of roughly 2 mg/dL shows a slight but steady difference in blood glucose levels between urban and rural areas. This pattern points to a comparatively elevated metabolic risk among urban dwellers, which may be a reflection of lifestyle, food, and exercise disparities between urban and rural areas.

ii. Body Mass Index (BMI)

Table 2: Mean blood glucose level by BMI category

BMI category	**Mean (mg/dL)**	**SE**	**95% CI**
Less than 18.5	106.37	0.14	(106.10, 106.65)
18.5–24.9	110.71	0.12	(110.47, 110.95)
Greater than 24.9	120.26	0.28	(119.71, 120.81)

A significant gradient in blood glucose levels across BMI categories is shown by the results in Table 2. The mean glucose level is 106.37 mg/dL for those with a BMI of less than 18.5 and 110.71 mg/dL for those in the normal BMI range (18.5–24.9). Those with a BMI higher than 24.9 have the highest mean glucose level, 120.26 mg/dL. There is a significant correlation between excess body weight and elevated blood glucose levels, as evidenced by the nearly 14 mg/dL difference between underweight and overweight individuals.

iii. Age

Table 3: Mean blood glucose level by age group

Age group (years)	Mean (mg/dL)	SE	95% CI
15–19	104.57	0.14	(104.29, 104.84)
20–24	106.50	0.15	(106.21, 106.80)
25–29	108.58	0.16	(108.27, 108.90)
30–34	112.38	0.25	(111.90, 112.86)
35–39	115.39	0.27	(114.86, 115.92)
40–44	120.38	0.37	(119.65, 121.11)
45–49	124.65	0.44	(123.79, 125.52)

Table 3 reveals a strong and monotonic increase in mean blood glucose levels with advancing age. Individuals aged 15–19 years have the lowest mean glucose level (104.57 mg/dL), while those aged 45–49 years exhibit the highest mean level (124.65 mg/dL). The difference of approximately 20 mg/dL between the youngest and oldest age groups indicates a substantial age-related gradient in blood glucose levels.

iv. Education

Table 4: Mean blood glucose level by educational attainment

Education level	Mean (mg/dL)	SE	95% CI
No education	114.43	0.20	(114.03, 114.84)
Primary	115.01	0.32	(114.39, 115.63)
Secondary	111.32	0.15	(111.03, 111.60)
Higher	109.82	0.23	(109.38, 110.27)

As shown in Table 4, mean blood glucose levels decline with increasing educational attainment. Individuals with no education or only primary education report higher mean glucose levels (around 114–115 mg/dL) compared to those with higher education (109.82 mg/dL). The observed difference of approximately 5 mg/dL suggests an inverse association between education and blood glucose levels.

v. Caste

Table 5: Mean blood glucose level by caste

Caste	Mean (mg/dL)	SE	95% CI
Scheduled Caste	111.89	0.22	(111.46, 112.32)
Scheduled Tribe	109.76	0.26	(109.25, 110.27)
Other Backward Class	112.43	0.19	(112.05, 112.81)
Others	113.15	0.24	(112.68, 113.62)

There are statistically significant variations in mean blood glucose levels between caste groups, as shown in Table 5. The mean blood glucose level is lowest among Scheduled Tribes (109.76 mg/dL), while it is higher among Other Backward Classes (112.43 mg/dL) and other castes (113.15 mg/dL). Significant caste-based variations in blood glucose levels are suggested by the difference of roughly 2.7 mg/dL between Scheduled Tribes and Other Backward Classes and roughly 3.4 mg/dL between Scheduled Tribes and other castes. These variations might be the result of dietary habits, caste-specific exposure to metabolic risk factors, and underlying socioeconomic inequalities.

vi. Religion

Table 6: Mean Blood Glucose Level by Religion

Religion	Mean Glucose (mg/dl)	Std. Error	95% CI
Hindu	112.17	0.15	111.88 – 112.46
Muslim	110.91	0.17	110.58 – 111.25
Christian	113.39	0.41	112.59 – 114.19
Other religions	111.60	0.38	110.86 – 112.34

Survey-weighted mean blood glucose levels by religion are shown in Table 6. Christians have the highest mean glucose level (113.39 mg/dl), followed by Hindus (112.17 mg/dl). People of other religions report an intermediate mean glucose level (111.60 mg/dl), while Muslims report a relatively lower mean (110.91 mg/dl).

The confidence intervals show little overlap between some categories, indicating statistically significant variation even though the absolute differences in mean glucose levels between religious groups are small. It is unlikely that religious affiliation alone accounts for these disparities; rather, religion may reflect more general variations in lifestyle choices, food habits, and socioeconomic makeup. From a demographic standpoint, religion serves as a contextual background feature that indirectly affects health outcomes through resource access and culturally mediated behaviors.

vii. Sex of Household Head

Table 7: Mean Blood Glucose Level by Sex of Household Head

Sex of HH	Mean Glucose (mg/dl)	Std. Error	95% CI
Male	112.17	0.12	111.93 – 112.40
Female	112.56	0.24	112.09 – 113.02

The survey-weighted mean blood glucose levels by household head sex are in Table 7. People who live in households headed by women report a slightly higher mean glucose level (112.56 mg/dl) than people who live in households headed by men (112.17 mg/dl).

The observed variation is not statistically significant, as evidenced by the small difference in mean glucose levels across household headship categories and the significant overlap between the confidence intervals. The sex of the head of the household has little independent influence on blood glucose levels and, from a demographic perspective, reflects household structure and economic vulnerability more so than it does metabolic health.

viii. Wealth Index

Table 8: Mean Blood Glucose Level by Wealth Index

Wealth Quintile	Mean Glucose (mg/dl)	Std. Error	95% CI
Poorest	110.93	0.20	110.53 – 111.33
Poorer	110.91	0.17	110.58 – 111.25
Middle	112.17	0.22	111.74 – 112.60
Richer	113.39	0.26	112.89 – 113.89
Richest	113.69	0.28	113.14 – 114.23

The mean blood glucose levels for each wealth quintile are shown in Table 8. With mean glucose levels gradually rising from the poorest quintile (110.93 mg/dl) to the richest quintile (113.69 mg/dl), a distinct socioeconomic gradient is evident.

There is a limited overlap between the confidence intervals for the wealthier and poorer groups, suggesting statistically significant differences. Demographic and epidemiological data that associate higher socioeconomic status with lifestyle-related risk factors like decreased physical activity, dietary changes, and a higher prevalence of overweight and obesity are in line with this pattern. Therefore, wealth becomes a significant background factor influencing blood glucose levels through environmental and behavioral pathways.

Conclusion

The analysis of average blood glucose levels across important background characteristics shows clear differences within the population. Age and body mass index are the strongest factors; blood glucose levels rise steadily with older age and higher BMI categories. Socioeconomic factors, especially education and wealth, also show clear patterns, with richer and less educated groups having higher average glucose levels. Living in urban areas is linked to slightly higher glucose levels compared to rural areas, reflecting possible lifestyle and environmental influences. Differences based on caste and religion, while smaller, are still statistically significant for some groups, highlighting how social stratification affects health outcomes. Overall, the findings show that blood glucose levels are not randomly distributed; they are influenced by demographic, socioeconomic, and cultural background factors. This emphasizes the need for a population-based approach to understanding metabolic health.

Weighted Prevalence of Prediabetes and Diabetes

Estimate the weighted prevalence of prediabetes and diabetes by background characteristics, and assess their association with those characteristics.

Definition of Glycaemic Status

Glycaemic status was classified based on plasma glucose measurements, using standard diagnostic cut-offs. Individuals who had not eaten for at least eight hours were classified as normal if plasma glucose was below 100 mg/dL, prediabetic if it was between 100 and 125 mg/dL, and diabetic if it was 126 mg/dL or higher. For those who had eaten within the last eight hours, plasma glucose levels below 140 mg/dL were considered normal, values between 140 and 199 mg/dL as prediabetic, and values of 200 mg/dL or above as diabetic. All estimates are survey-weighted to ensure national representation.

Overall Weighted Prevalence

Table 9: Weighted prevalence of glycaemic status

Glycaemic status	**Percentage (%)**
Normal	85.67
Prediabetic	11.07
Diabetic	3.26

The weighted prevalence estimates show that about 11% of people are prediabetic and 3.3% are diabetic. This highlights a significant issue with impaired glucose regulation in the population.

Background Characteristics

i. Place of Residence

Table 10: Weighted prevalence of glycaemic status by place of residence (column percentages)

Residence	Normal	Prediabetic	Diabetic
Urban	86.20	10.27	3.52
Rural	85.43	11.44	3.14

The prevalence of diabetes is slightly higher in urban areas, at 3.52%, compared to 3.14% in rural areas. However, prediabetes is more common in rural populations, with a rate of 11.44%, while urban populations have a rate of 10.27%. The difference in diabetes prevalence between urban and rural areas is about 0.4 percentage points. While this difference is small, it is statistically significant ($p < 0.001$). These results indicate that living in urban areas is linked to a modestly higher risk of diabetes, while rural populations face a greater challenge with prediabetes. This may reflect differences in lifestyle changes and access to healthcare.

ii. Body Mass Index

Table 11: Weighted prevalence of glycaemic status by body mass index (column percentages)

BMI category	Normal	Prediabetic	Diabetic
Less than 18.5	88.55	9.53	1.92
18.5–24.9	87.18	10.26	2.56
Greater than 24.9	80.00	14.12	5.89

Body mass index shows the strongest link to glycaemic status among all the characteristics studied. The rate of diabetes sharply increases from 1.9% in underweight individuals to 2.6% in the normal BMI range, reaching 5.9% in those with a BMI over 24.9. This means there is more than a threefold rise in diabetes rates between underweight and overweight individuals. Prediabetes also rises steadily, from 9.5% to 14.1% in the same categories. The significant gradient and large differences highlight that excess body weight is a key factor in dysglycaemia.

iii. Age

Table 12: Weighted prevalence of glycaemic status by age group (column percentages)

Age group (years)	Normal	Prediabetic	Diabetic
15–19	89.93	8.50	1.57
20–24	90.01	8.37	1.62
25–29	88.67	9.29	2.05
30–34	85.96	11.11	2.93
35–39	83.69	12.15	4.15
40–44	80.03	14.60	5.37
45–49	76.75	16.28	6.97

A clear age gradient in glycaemic status exists. The prevalence of diabetes goes up from 1.6% in individuals aged 15 to 19 years to 7.0% in those aged 45 to 49 years. This showcases more than a fourfold increase across the reproductive age range. Similarly, prediabetes rates rise from 8.5% in the youngest group to 16.3% in the oldest. The steady increase across age groups, along with significant absolute differences, shows that getting older is one of the main factors linked to poor glucose regulation.

iv. Education

Table 13: Weighted prevalence of glycaemic status by education level (column percentages)

Education level	Normal	Prediabetic	Diabetic
No education	82.39	13.45	4.16
Primary	83.33	12.84	3.83
Secondary	86.75	10.25	3.00
Higher	88.77	8.88	2.35

Educational attainment clearly relates to dysglycaemia. People with no education have the highest rates of diabetes at 4.16% and prediabetes at 13.45%. In contrast, those with higher education report much lower rates, with 2.35% having diabetes and 8.88% being prediabetic. The difference in diabetes rates between the lowest and highest education groups is about 1.8 percentage points. This shows significant educational inequality in metabolic health. Education likely influences this issue through various pathways, including health literacy, job patterns, and lifestyle choices.

v. Caste

Table 14: Weighted prevalence of glycaemic status by caste (column percentages)

Caste	**Normal**	**Prediabetic**	**Diabetic**
Scheduled Caste	85.92	10.93	3.15
Scheduled Tribe	86.96	10.63	2.41
OBC	84.77	11.61	3.62
Others	86.51	10.43	3.06

Caste-based differences in glycaemic status are evident, though not very large. The diabetes rate is lowest among Scheduled Tribes at 2.41% and highest among Other Backward Classes at 3.62%. The absolute difference of about 1.2 percentage points highlights ongoing social gaps in metabolic risk. These differences are statistically significant ($p < 0.001$) and likely reflect disparities related to caste in socioeconomic conditions, eating habits, and access to preventive healthcare.

vi. Religion

Table 15: Weighted prevalence of glycaemic status by religion (column percentages)

Religion	Normal	Prediabetic	Diabetic
Hindu	85.58	11.18	3.24
Muslim	85.73	11.00	3.27
Christian	84.76	10.79	4.44
Others	89.23	8.13	2.64

Religious differences in glycaemic status are statistically significant, but still quite modest. The prevalence of diabetes is 2.64% among people of other religions and 4.44% among Christians. Hindus and Muslims report intermediate levels, around 3.2% to 3.3%. Because the absolute differences are limited, religion should be seen as a marker that reflects various socioeconomic and lifestyle factors instead of an independent cause.

vii. Sex of Household Head

Table 16: Weighted prevalence of glycaemic status by sex of household head (column percentages)

Sex of HH head	Normal	Prediabetic	Diabetic
Male	85.90	10.92	3.18
Female	84.50	11.81	3.69

Individuals living in female-headed households report a slightly higher prevalence of prediabetes (11.81%) and diabetes (3.69%) compared to those in male-headed households (10.92% and 3.18%, respectively). The absolute differences are small. While statistically significant, they indicate limited meaningful variation. The sex of the household head likely shows household-level vulnerability rather than being a direct factor affecting glycaemic outcomes.

viii. Wealth Index

Table 17: Weighted prevalence of glycaemic status by wealth index (column percentages)

Wealth quintile	Normal	Prediabetic	Diabetic
Poorest	83.61	13.19	3.21
Poorer	85.86	11.28	2.86
Middle	85.80	11.11	3.09
Richer	85.82	10.43	3.74
Richest	87.16	9.45	3.39

The rate of prediabetes decreases steadily with increasing wealth. It starts at 13.19% among the poorest and drops to 9.45% among the richest. In contrast, diabetes rates do not follow a simple pattern. They stay high in wealthier groups, reaching a peak of 3.74% in the richest quintile. These trends indicate a dual challenge. Economic hardship is linked to higher rates of prediabetes. At the same time, increased wealth may lead to a higher risk of lifestyle factors that contribute to the development of diabetes.

Conclusion

Overall, the findings demonstrate that impaired glucose regulation is unevenly distributed across demographic and socioeconomic groups. Age and body mass index emerge as the most consequential correlates, exhibiting large and monotonic gradients. Socioeconomic characteristics—particularly education and wealth—also display systematic associations, underscoring the role of social stratification in shaping metabolic health. While several associations are statistically significant despite modest absolute differences, this reflects the large sample size and high precision of survey estimates. Substantively, the results highlight the need to interpret statistical significance alongside effect size when assessing population-level health inequalities.

Age-Specific Prevalence of Dysglycaemia

Estimate the prevalence of prediabetes and diabetes by age, stratified by sex and plot the prevalence. Interpret your findings.

To look at the age pattern of impaired glucose regulation, the rates of prediabetes and diabetes were estimated across seven age groups, each spanning five years, among women aged 15 to 49 years. These age-based estimates shed light on how metabolic risk builds up throughout the reproductive years and help pinpoint the age groups that are especially at risk for dysglycaemia.

Table 18: Age-wise prevalence of prediabetes and diabetes among women aged 15–49 years

Age group (years)	Prediabetes (%)	Diabetes (%)
15–19	7.9	1.5
20–24	7.8	1.5
25–29	8.7	1.9
30–34	10.4	2.8
35–39	11.4	3.9
40–44	13.7	5.0
45–49	15.3	6.5

The Table 18 shows a clear and steady increase in the prevalence of both prediabetes and diabetes as people get older. Prediabetes prevalence stays below 9% until age 29 but rises consistently after that, reaching 15.3% among women aged 45 to 49 years. This reflects almost a twofold increase during the reproductive years.

Diabetes prevalence has a much sharper age trend. It affects only about 1.5% of women in the 15 to 19 and 20 to 24 age groups. However, the prevalence rises gradually with age, surpassing 5% among women aged 40 to 44 years and hitting 6.5% in the oldest age group. The growing difference between prediabetes and diabetes in older ages indicates a shift from impaired glucose regulation to full diabetes as age increases.

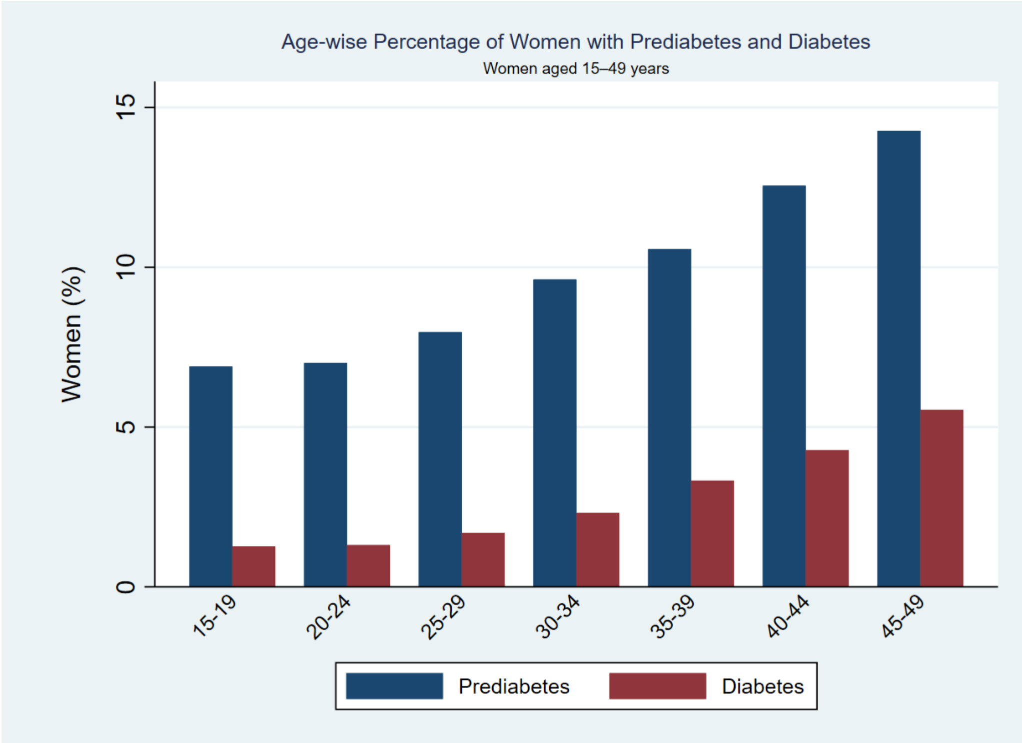

Figure 1: Age-wise percentage of women with prediabetes and diabetes

The graphical presentation clearly shows the age trend in dysglycaemia. Prediabetes prevalence gradually increases across different age groups. This trend indicates that metabolic vulnerability grows throughout the reproductive life course. In contrast, the prevalence of diabetes increases more sharply after age 30, with much steeper increases in older groups.

The gap between the two curves at older ages highlights the idea of cumulative metabolic risk and the delayed shift from prediabetes to diabetes. In general, the figure indicates that middle-aged women are at high risk of diabetes. This stresses the need for early identification of prediabetes and preventive measures targeted at specific age groups.

Multivariate Analysis of Glycaemic Severity

Fit an appropriate regression model to identify factors that influence the severity of diabetes among women aged 15-49 years. Provide your justification for choosing the model and interpret your findings.

Table 19: Ordinal logistic regression of glycaemic severity among women aged 15–49 years

Background characteristic	Odds Ratio	95% CI
Age group (ref: 15–19)		
20–24	0.96	(0.90, 1.03)
25–29	1.06	(0.99, 1.14)
30–34	1.30***	(1.21, 1.40)
35–39	1.53***	(1.43, 1.65)
40–44	1.97***	(1.84, 2.11)
45–49	2.41***	(2.25, 2.58)
Body Mass Index (ref: Underweight)		
Normal (18.5–24.9)	1.05*	(1.00, 1.11)
Overweight/Obese (>24.9)	1.72***	(1.62, 1.83)
Place of residence (ref: Urban)		
Rural	1.01	(0.95, 1.07)
Wealth index (ref: Poorest)		
Poorer	0.81***	(0.77, 0.86)
Middle	0.77***	(0.72, 0.81)
Richer	0.74***	(0.69, 0.79)
Richest	0.61***	(0.57, 0.66)

Notes: *** p<0.001, * p<0.05. Odds ratios represent the likelihood of being in a higher glycaemic severity category.

Since glycaemic status shows clear stages of increasing disease severity (normal, prediabetic, and diabetic), we need a regression model that considers this natural order. An ordinal logistic regression model is appropriate because it estimates the likelihood of being in a higher glycaemic severity category while keeping the order of the outcome intact. This method works better than linear or binary regression models, which either overlook clinical thresholds or miss details on disease progression.

Table 19 presents the results of the ordinal logistic regression. It examines the link between chosen background characteristics and the severity of diabetes in women aged 15 to 49 years.

Table 20: Summary of key factors influencing glycaemic severity among women

Factor	Association with severity of diabetes
Age	Increases strongly with age, especially after 30 years
Body mass index	Much higher severity among overweight/obese women
Wealth status	Lower severity among women from richer households
Place of residence	No significant difference after adjustment

Table 20 summarizes the key findings from the regression analysis. Age and body mass index emerge as the strongest factors influencing glycaemic severity among women. The likelihood of severe diabetes increases sharply with age, particularly after 30 years, and is substantially higher among overweight and obese women. Wealth status shows a protective effect, with women from richer households experiencing lower severity. Place of residence does not exhibit an independent association after controlling for other factors.