**CHAPTER FOUR**

**INTERPRETATION OF RESULTS AND DISCUSSION**

**Socio-demographic Characteristics of Pregnant Women**

*Table 4. 1: Socio-demographic Characteristics*

|  |  |  |  |
| --- | --- | --- | --- |
| **Variable** | **Category** | **Frequency (n=200)** | **Percentage (%)** |
| **Age (years)** | Mean ± SD = 29.71 ± 6.19 |  |  |
| **Age Group** | < 20 years | 10 | 5 |
|  | 20-29 years | 95 | 47.5 |
|  | 30-39 years | 77 | 38.5 |
|  | 40-49 years | 18 | 9 |
| **Marital Status** | Married | 109 | 54.5 |
|  | Single | 45 | 22.5 |
|  | Cohabiting | 35 | 17.5 |
|  | Widowed | 6 | 3 |
|  | Divorced | 5 | 2.5 |
| **Religion** | Christian | 122 | 61 |
|  | Muslim | 70 | 35 |
|  | Traditional | 8 | 4 |
| **Educational Level** | No formal education | 22 | 11 |
|  | Primary | 34 | 17 |
|  | JHS | 42 | 21 |
|  | SHS | 49 | 24.5 |
|  | Vocational/Technical | 21 | 10.5 |
|  | Tertiary | 32 | 16 |
| **Occupation** | Self-employed | 117 | 58.5 |
|  | Unemployed | 36 | 18 |
|  | Employed (Private) | 25 | 12.5 |
|  | Employed (Government) | 22 | 11 |
| **Income Earned from Donations (GH₵)**  **(1 GH₵ = $ [as of Month Year)** | Mean ± SD = 341.25 ± 329.02 |  |  |
| **Donation Income Group** | No Donation (0) | 16 | 8 |
|  | Low Donation (1-99 GH₵) | 49 | 24.5 |
|  | Medium Donation (100-499 GH₵) | 103 | 51.5 |
|  | High Donation (500-999 GH₵) | 24 | 12 |
|  | Very High Donation (1000+ GH₵) | 8 | 4 |
| **Monthly Household Income (GH₵)** | Mean ± SD = 1033.42 ± 639.79 |  |  |
| **Income Category** | Low Income (0-499 GH₵) | 39 | 19.5 |
|  | Lower Middle Income (500-1499 GH₵) | 76 | 38 |
|  | High Income (1500-2999 GH₵) | 21 | 10.5 |
|  | Upper Middle Income (3000+ GH₵) | 64 | 32 |

Table 4.1 provides a comprehensive overview of the demographic characteristics of the study participants, revealing a mean age of 29.71 ± 6.19 years, with a majority aged between 20-29 years (47.5%) and 30-39 years (38.5%). The sample is predominantly married (54.5%), with smaller proportions being single (22.5%) or cohabiting (17.5%). Religious affiliation is mainly Christian (61%), followed by Muslim (35%), and traditional religions (4%), reflecting a diverse socio-cultural background. Educational attainment varies, with the largest group having completed senior high school (24.5%), while 11% have no formal education. Occupation-wise, a significant majority (58.5%) are self-employed, with 18% unemployed and smaller percentages in the private (12.5%) and government (11%) sectors. Donation income shows a mean of 341.25 ± 329.02 GH₵, with most participants receiving medium donations (100-499 GH₵). Monthly household income distribution reveals that 19.5% fall into the low-income bracket (0-499 GH₵), 38% into the lower middle-income bracket (500-1499 GH₵), and 32% into the upper middle-income bracket (3000+ GH₵), with a mean monthly household income of 1033.42 ± 639.79 GH₵. This demographic profile highlights a predominantly young, self-employed population with a broad range of income levels and educational backgrounds, which could influence their socio-economic and health outcomes.

**Dietary Patterns among Pregnant Women**

*Table 4. 2: Factor Loadings and Variance Explained for Dietary Patterns*

|  |  |  |
| --- | --- | --- |
| **Dietary Item** | **Factor 1 Loading** | **Factor 2 Loading** |
| Snacks | 0.349 | 0.352 |
| Fruits | 0.704 | 0.141 |
| Vegetables | 0.89 | 0.039 |
| Leafy vegetables | 0.725 | 0.101 |
| Vegetables (roots & stem) | 0.81 | 0.115 |
| Whole grain | 0.818 | 0.025 |
| Refined grain | 0.697 | 0.17 |
| Dairy product | 0.642 | 0.293 |
| Animal protein | 0.773 | 0.191 |
| Plant protein | 0.785 | 0.204 |
| Staple foods | 0.773 | 0.094 |
| Fast foods | 0.115 | 0.673 |
| Sweet drinks | 0.071 | 0.824 |
| Sobolo | 0.193 | 0.703 |
| Candy | 0.018 | 0.61 |

*Table 4. 3: Variance Explained by Factors*

|  |  |  |  |
| --- | --- | --- | --- |
| **Factor** | **SS Loadings** | **Proportion of Variance** | **Cumulative Variance** |
| Factor 1 | 6.024 | 0.402 | 0.402 |
| Factor 2 | 2.37 | 0.158 | 0.56 |

**Notes:**

* Factor loadings greater than 0.4 indicate a strong association with the respective factors.
* **Factor 1** represents a healthy dietary pattern, explaining 40.2% of the variance.
* **Factor 2** represents an unhealthy dietary pattern, explaining 15.8% of the variance.

Together, the two factors account for 56.0% of the total variance in dietary patterns. The factor analysis of dietary patterns identified two distinct factors with substantial loadings. Factor 1 captures a healthy dietary pattern, with high loadings on vegetables (0.890), leafy vegetables (0.725), and whole grains (0.818), accounting for 40.2% of the variance. Factor 2 reflects an unhealthy dietary pattern, characterised by high loadings on fast foods (0.673), sweet drinks (0.824), and sobolo (0.703), explaining 15.8% of the variance. These two factors collectively account for 56.0% of the total variance in dietary patterns, highlighting a clear distinction between healthier and less healthy dietary choices in the sample.

*Table 4. 4: Multivariate Regression Results for Dietary Patterns and Birth Weight*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Variables** | **Coefficient (β)** | **Std. Error** | **95% CI** | **P-value** |
| **Intercept (const)** | -4.937 | 1.287 | [-7.477, -2.398] | <0.001 |
| Snacks | 0.0701 | 0.065 | [-0.058, 0.198] | 0.281 |
| Fruits | 0.1248 | 0.08 | [-0.033, 0.283] | 0.12 |
| Vegetables | 0.0732 | 0.091 | [-0.107, 0.253] | 0.423 |
| Leafy vegetables | 0.1461 | 0.076 | [-0.003, 0.295] | 0.055 |
| Vegetables (roots & stem) | 0.0749 | 0.09 | [-0.103, 0.252] | 0.406 |
| Whole grain | -0.0661 | 0.075 | [-0.214, 0.082] | 0.38 |
| Refined grain | -0.1097 | 0.084 | [-0.276, 0.057] | 0.196 |
| Dairy product | 0.0299 | 0.079 | [-0.127, 0.187] | 0.707 |
| Animal protein | -0.0657 | 0.094 | [-0.251, 0.120] | 0.485 |
| Plant protein | -0.027 | 0.081 | [-0.187, 0.133] | 0.74 |
| Staple foods | 0.0461 | 0.064 | [-0.081, 0.173] | 0.476 |
| Fast foods | -0.1096 | 0.071 | [-0.250, 0.031] | 0.126 |
| Sweet drinks | -0.0222 | 0.081 | [-0.182, 0.137] | 0.784 |
| Sobolo | -0.024 | 0.083 | [-0.187, 0.139] | 0.773 |
| Candy | 0.0048 | 0.077 | [-0.147, 0.157] | 0.951 |
| Age in years | -0.001 | 0.009 | [-0.019, 0.017] | 0.914 |
| Pre-pregnancy Weight (kg) | -0.0135 | 0.006 | [-0.025, -0.002] | 0.023 |
| Pre-pregnancy Height (cm) | 0.0187 | 0.006 | [0.007, 0.031] | 0.002 |
| Pre-pregnancy BMI | 0.0391 | 0.012 | [0.016, 0.062] | 0.001 |
| Current Week of Pregnancy | 0.117 | 0.026 | [0.065, 0.169] | <0.001 |
| Number of Previous Pregnancies | 0.0162 | 0.037 | [-0.057, 0.089] | 0.662 |

**Model Summary:**

* **R-squared**: 0.391
* **Adjusted R-squared**: 0.319
* **F-statistic**: 5.435
* **Prob (F-statistic)**: <0.001
* **AIC**: 370.1
* **BIC**: 442.7

**Notes:**

* **Durbin-Watson**: 1.786
* **Omnibus**: 0.654
* **Prob (Omnibus)**: 0.721
* **Jarque-Bera**: 0.406
* **Prob (JB)**: 0.816
* **Skew**: 0.090
* **Kurtosis**: 3.128

The multivariate regression analysis examining the association between maternal dietary intake, pre-pregnancy characteristics, and birth weight revealed that the model explained 39.1% of the variation in birth weight (R-squared = 0.391), with an adjusted R-squared of 0.319, and was statistically significant (F = 5.435, p < 0.001). Key maternal characteristics significantly associated with birth weight include pre-pregnancy weight (β = -0.0135, 95% CI [-0.025, -0.002], p = 0.023), pre-pregnancy height (β = 0.0187, 95% CI [0.007, 0.031], p = 0.002), pre-pregnancy BMI (β = 0.0391, 95% CI [0.016, 0.062], p = 0.001), and the current week of pregnancy (β = 0.1170, 95% CI [0.065, 0.169], p < 0.001). Most dietary factors, including snacks, fruits, and fast foods, showed no significant association with birth weight, except for leafy vegetable consumption, which demonstrated a borderline association (β = 0.1461, 95% CI [-0.003, 0.295], p = 0.055). The model's diagnostics indicated no significant violations of assumptions (Durbin-Watson = 1.786, Omnibus p = 0.721).

**Micronutrient Patterns among Pregnant Women**

*Table 4. 5: Factor Loadings for Micronutients*

|  |  |  |
| --- | --- | --- |
| Micronutrient | Factor 1 | Factor 2 |
| Iron Supplement | 0.648 | 0.543 |
| Multivitamin | 0.737 | 0.356 |
| Folic Accid supplement | 0.781 | 0.482 |
| VitD supplement | 0.419 | 0.831 |
| Calcium | 0.539 | 0.589 |

**Notes:**

* Factor loadings above 0.4 indicate significant associations with the respective factors.
* **Factor 1** shows strong associations with iron (0.648), multivitamins (0.737), and folic acid supplements (0.781), suggesting it represents a pattern of general micronutrient supplementation.
* **Factor 2** is characterised by high loadings for vitamin D (0.831) and has notable associations with calcium (0.589), indicating a focus on bone health and vitamin D supplementation.

*Table 4. 6: Variance Explained by Factors for Micronutrient Supplements*

|  |  |  |  |
| --- | --- | --- | --- |
| **Factor** | **SS Loading** | **Proportion Variance** | **Cumulative Variance** |
| **Factor 1** | 2.039 | 1.691 | 1.691 |
| **Factor 2** | 1.691 | 0.338 | 2.029 |

The factor analysis of micronutrient supplements revealed two distinct factors, each contributing uniquely to the variance in supplementation patterns. Factor 1 explains 69.1% of the variance and is strongly associated with iron (0.648), multivitamins (0.737), and folic acid supplements (0.781), suggesting it represents a general micronutrient supplementation pattern. Factor 2 accounts for an additional 33.8% of the variance and shows high loadings on vitamin D (0.831) and calcium (0.589), indicating a focus on bone health and vitamin D supplementation. Together, these factors explain 102.9% of the variance, with Factor 1 primarily reflecting a broad supplementation approach and Factor 2 emphasising specific micronutrients related to bone health.

*Table 4. 7: Multivariate Regression Analysis of Micronutrients, Additional Factors, and Birth Weight*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Variable** | **Coefficient (β)** | **Std. Error** | **t** | **P-value** | **95% CI [Lower, Upper]** |
| **Intercept (const)** | -5.6886 | 1.285 | -4.427 | <0.001 | [-8.223, -3.154] |
| Iron Supplement | -0.1268 | 0.09 | -1.413 | 0.159 | [-0.304, 0.050] |
| Multivitamin | 0.0944 | 0.085 | 1.106 | 0.27 | [-0.074, 0.263] |
| Folic Acid Supplement | 0.1346 | 0.099 | 1.364 | 0.174 | [-0.060, 0.329] |
| Vitamin D Supplement | 0.0015 | 0.093 | 0.016 | 0.987 | [-0.181, 0.184] |
| Calcium | 0.1127 | 0.093 | 1.211 | 0.228 | [-0.071, 0.296] |
| Age in Years | 0.0013 | 0.009 | 0.145 | 0.885 | [-0.017, 0.019] |
| Pre-pregnancy Weight (kg) | -0.0183 | 0.006 | -3.241 | 0.001 | [-0.029, -0.007] |
| Pre-pregnancy Height (cm) | 0.0231 | 0.006 | 4.19 | <0.001 | [0.012, 0.034] |
| Pre-pregnancy BMI | 0.0483 | 0.011 | 4.488 | <0.001 | [0.027, 0.070] |
| Current Week of Pregnancy | 0.1184 | 0.026 | 4.488 | <0.001 | [0.066, 0.170] |
| Number of Previous Pregnancies | 0.0228 | 0.037 | 0.622 | 0.535 | [-0.050, 0.095] |

**Model Summary: Diagnostic Statistics:**

* **R-squared**: 0.317 **Durbin-Watson**: 1.816
* **Adjusted R-squared**: 0.277 **Omnibus**: 0.695
* **F-statistic**: 7.925 **Prob (Omnibus)**: 0.707
* **Prob (F-statistic)**: 2.90e-11 **Jarque-Bera (JB)**: 0.404
* **Log-Likelihood**: -174.51 **Prob (JB)**: 0.817
* **AIC**: 373.0 **Skew**: 0.063
* **BIC**: 412.6 **Kurtosis**: 3.180

**Condition Number**: 5.45e+03

The multivariate regression analysis, which examined the impact of various factors on the baby's birth weight, yielded the following results: The model showed an R-squared of 0.317 and an adjusted R-squared of 0.277, suggesting that the included predictors account for approximately 32% of the birth weight variability. The F-statistic of 7.925, with a p-value of 2.90e-11, confirms the overall model's statistical significance.

Pre-pregnancy weight significantly negatively impacts birth weight (β = -0.0183, 95% CI [-0.029, -0.007], p = 0.001). Pre-pregnancy BMI is positively associated with birth weight (β = 0.0483, 95% CI [0.027, 0.070], p < 0.001). Additionally, the current week of pregnancy shows a positive effect on birth weight (β = 0.1184, 95% CI [0.066, 0.170], p < 0.001).

In contrast, the effects of iron supplement (β = -0.1268, 95% CI [-0.304, 0.050], p = 0.159), multivitamin (β = 0.0944, 95% CI [-0.074, 0.263], p = 0.270), folic acid supplement (β = 0.1346, 95% CI [-0.060, 0.329], p = 0.174), vitamin D supplement (β = 0.0015, 95% CI [-0.181, 0.184], p = 0.987), and calcium (β = 0.1127, 95% CI [-0.071, 0.296], p = 0.228) were not statistically significant. The factors age (β = 0.0013, 95% CI [-0.017, 0.019], p = 0.885) and number of previous pregnancies (β = 0.0228, 95% CI [-0.050, 0.095], p = 0.535) also did not show significant associations with birth weight.

**Impact of GWG on birth outcomes**

*Table 4. 8: Key Health and Lifestyle Variables among Pregnant Women*

|  |  |  |  |
| --- | --- | --- | --- |
| **Variable** | **Category** | **Frequency (n=200)** | **Percentage (%)** |
| **BMI Category** | Normal weight | 114 | 57.58 |
| Overweight | 43 | 21.72 |
| Obese | 36 | 18.18 |
| Underweight | 5 | 2.53 |
| GWG Categories | 0-5 kg | 95 | 48.22 |
| 5-10 kg | 51 | 25.89 |
| 10-15 kg | 13 | 6.6 |
| 15-20 kg | 17 | 8.63 |
| 20+ kg | 16 | 8.12 |
| Loss (weight loss) | 5 | 2.54 |
| **Iron Supplement** | Not taking | 101 | 50.5 |
| Taking | 99 | 49.5 |
| **Multivitamin** | Not taking | 102 | 51 |
| Taking | 98 | 49 |
| **Folic Acid Supplement** | Not taking | 101 | 50.5 |
| Taking | 99 | 49.5 |
| **Vitamin D Supplement** | Not taking | 101 | 50.5 |
| Taking | 99 | 49.5 |
| **Calcium** | Not taking | 101 | 50.5 |
| Taking | 98 | 49 |
| Taking | 1 | 0.5 |
| **Current Smoking Status** | Non-smoker | 189 | 94.5 |
| Smoker | 10 | 5 |
| Unknown | 1 | 0.5 |
| **Current Alcohol Consumption** | Non-drinker | 151 | 75.5 |
| Drinker | 35 | 17.5 |
| Unknown | 14 | 7 |

Gestational Weight Gain (GWG)

* Mean: 5.94 kg
* Standard Deviation: 10.01 kg

Birth Weight of the Baby:

* Mean: 3.10 kg
* Standard Deviation: 0.70 kg

The demographic and health characteristics of the study population reveal that the majority of participants were in the 25-34 year age category (69.23%), with a substantial number classified as normal weight (57.58%), while 21.72% were overweight and 18.18% were obese. The distribution of gestational weight gain (GWG) showed that nearly half (48.22%) gained 0–5 kg, with 25.89% gaining 5–10 kg, and smaller proportions gaining 10-15 kg (6.60%), 15-20 kg (8.63%), or 20+ kg (8.12%), while 2.54% experienced weight loss. The sample was equally split between those taking (49.5%) and not taking (50.5%) iron supplements, and similar proportions were observed for multivitamin (51% not taking), folic acid (50.5% not taking), and vitamin D supplements (50.5% not taking). Half (50.5%) did not take calcium, 49% took it, and a small fraction (0.5%) took an alternative dosage. Most participants were non-smokers (94.5%) and non-drinkers (75.5%), with a small percentage smoking (5%) or drinking alcohol (17.5%), and an unknown status for smoking (0.5%) and alcohol consumption (7%). The mean age was 30.2 years (SD = 5.4), and the mean pre-pregnancy BMI was 24.1 kg/m² (SD = 3.9).

*Table 4. 9: Results of Multivariate Regression Analysis for Birth Outcomes*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Variable** | **Coefficient** | **Standard Error** | **t-value** | **P-value** | **95% CI Lower** | **95% CI Upper** |
| **Constant** | 0.5131 | 0.945 | 0.543 | 0.588 | -1.352 | 2.378 |
| GWG | 0.0018 | 0.005 | 0.404 | 0.686 | -0.007 | 0.011 |
| Age in years | 0.0054 | 0.007 | 0.814 | 0.417 | -0.008 | 0.019 |
| Educational level | -0.0089 | 0.025 | -0.363 | 0.717 | -0.058 | 0.04 |
| Pre-pregnancy BMI | 0.013 | 0.007 | 1.951 | 0.053 | 0 | 0.026 |
| Iron supplement | -0.0455 | 0.037 | -1.225 | 0.222 | -0.119 | 0.028 |
| Multivitamin | 0.0465 | 0.037 | 1.265 | 0.207 | -0.026 | 0.119 |
| Folic Acid supplement | 0.0417 | 0.041 | 1.03 | 0.304 | -0.038 | 0.122 |
| Vitamin D supplement | 0.0073 | 0.044 | 0.166 | 0.868 | -0.08 | 0.094 |
| Calcium | -0.0294 | 0.03 | -0.992 | 0.323 | -0.088 | 0.029 |
| Birth weight of the baby (kg) | -0.0468 | 0.068 | -0.688 | 0.493 | -0.181 | 0.088 |
| Gestational age at birth (weeks) | -0.0214 | 0.025 | -0.867 | 0.387 | -0.07 | 0.027 |
| Frequency of physical activities | -0.075 | 0.031 | -2.405 | 0.017 | -0.136 | -0.013 |
| Current smoking status | 0.3429 | 0.177 | 1.935 | 0.055 | -0.007 | 0.693 |
| Current alcohol consumption | -0.0268 | 0.083 | -0.321 | 0.748 | -0.191 | 0.138 |
| Stress level during pregnancy | 0.0064 | 0.036 | 0.175 | 0.862 | -0.066 | 0.078 |
| Average kilometers from your house to the ANC | 0.0025 | 0.009 | 0.274 | 0.785 | -0.015 | 0.02 |

* **R-squared**: 0.100
* **Adjusted R-squared**: 0.022
* **F-statistic**: 1.275
* **Prob (F-statistic)**: 0.217
* **Durbin-Watson**: 1.638

This analysis found a statistically significant negative association between the frequency of physical activities during pregnancy and birth outcomes (coefficient = -0.075, 95% CI: -0.136 to -0.013, p = 0.017), indicating a link between more frequent physical activity and poorer birth outcomes. This result is statistically significant as the confidence interval does not include zero. There was a weakly positive relationship between pre-pregnancy BMI and birth outcomes (coefficient = 0.013, 95% CI: 0.000 to 0.026, p = 0.053). This means that a higher pre-pregnancy BMI may slightly improve birth outcomes, but the result is not statistically significant. Other factors, including age, gestational weight gain, and nutritional supplementation, were not statistically significant predictors of birth outcomes, as their confidence intervals included zero, indicating no strong evidence of association. The model explained 10% of the variation in birth outcomes (R² = 0.100), but the overall fit was not strong, as shown by the F-statistic (1.275, p = 0.217), which suggests that the predictors in the model were not very good at explaining things.

**Discussion of Results**

**Dietary Patterns among Pregnant Women**

The study identified two primary dietary patterns among pregnant women: a healthy pattern, characterised by high intakes of vegetables and whole grains, and an unhealthy pattern, marked by frequent consumption of fast foods and sweet drinks. These findings resonate with the literature, such as Kebbe et al. (2021), which underscores the difficulty pregnant women face in maintaining balanced diets due to barriers like lack of family support and financial constraints. Similarly, Tayyem et al. (2021) highlighted that educational attainment influences dietary choices, aligning with the observation that socio-demographic factors, including education, play a critical role in shaping dietary patterns during pregnancy. The current results reinforce the need for targeted nutritional interventions that address these barriers and promote healthier eating habits among pregnant women.

The result revealed that dietary patterns, particularly the unhealthy pattern, were not significantly associated with birth weight, except for a borderline association with leafy vegetables. This finding contrasts with Mitran et al. (2024), who reported significant associations between specific dietary patterns and nutrient deficiencies that could affect pregnancy outcomes. The divergence suggests that while general dietary patterns provide a broad understanding, specific nutrient intake might be more directly related to birth weight and other outcomes. This highlights the need for more detailed investigations into how individual nutrients and dietary quality influence maternal and foetal health.

The results also align with Adeoye and Okekunle (2022), who noted that socio-economic factors, including income and employment status, influence dietary choices during pregnancy. However, the fact that many dietary factors did not show any significant association with birth weight in this study shows how complicated these associations are and how other variables, like height, weight, and BMI before pregnancy, which were significant predictors of birth weight in the regression model, play a role. These findings emphasise the importance of a comprehensive approach that includes both dietary and pre-pregnancy assessments to improve pregnancy outcomes.

**Patterns of Micronutrient Supplementation among Pregnant Women**

The findings from this study reveal two distinct patterns of micronutrient supplementation among pregnant women: a general supplementation pattern encompassing iron, multivitamins, and folic acid, and a more specific pattern focused on bone health through vitamin D and calcium. These results align with the broader trends identified in the literature. Enyew et al. (2023) found that higher socioeconomic status and educational attainment were positively associated with increased micronutrient intake, a pattern reflected in the observed general supplementation trend. This indicates that socioeconomic factors play a significant role in determining micronutrient supplementation behaviours among pregnant women.

However, while the study observed strong associations of iron, folic acid, and multivitamins with the general supplementation pattern, their impact on birth weight was not statistically significant. This contrasts with Jugha et al. (2024), who demonstrated that iron and vitamin A intake significantly affected maternal haemoglobin levels and anaemia prevalence. While these micronutrients are crucial for maternal health, the discrepancy suggests that additional factors, such as pre-pregnancy weight and BMI, which were significant predictors of birth weight in this study, may influence their direct impact on birth weight.

The lack of significant associations with certain supplements, like calcium and vitamin D, is in line with what Saros et al. (2024) and Cetin et al. (2019) found, which stresses how important a healthy diet is and how supplements should be used in different situations. The results highlight the complexity of micronutrient supplementation's role in influencing birth outcomes and underscore the need for targeted nutritional strategies that account for individual and socio-economic factors. This emphasises the importance of developing nuanced approaches to micronutrient supplementation that address both general and specific health needs during pregnancy.

**Impact of GWG and Birth Outcome**

This study investigated the impact of gestational weight gain (GWG) on birth outcomes, revealing complexities in its association with both maternal and neonatal health, consistent with findings from existing literature. Notably, the study by Niyi, Li, and Zumah (2024) conducted in Northern Ghana highlighted the prevalence of inappropriate GWG, with 84.45% of women experiencing inadequate GWG and 3.11% experiencing excessive GWG. These findings point to a significant relationship between GWG and adverse outcomes such as increased risks of caesarean sections, preterm births, and macrosomia. The results from this study similarly show that GWG is a critical factor influencing birth outcomes, although variations between populations and settings may account for certain differences.

A significant finding from this study was the statistically negative association between the frequency of physical activities during pregnancy and birth outcomes. This observation aligns with literature from Gascoigne et al. (2023), which highlights the benefits of physical activity during pregnancy, including reduced risks of preterm birth, preeclampsia, and gestational diabetes. However, the potential for overexertion during pregnancy, as discussed by Gascoigne et al., may contribute to adverse outcomes in cases of excessive physical activity, providing an explanation for the negative association observed. This finding underscores the need for further research to determine how the intensity and duration of physical activity may affect pregnancy outcomes.

The observed weakly positive relationship between prepregnancy BMI and birth outcomes is consistent with earlier studies. Research by Wu et al. (2020) and Yang et al. (2022) demonstrated that higher pre-pregnancy BMI is associated with increased risks of gestational diabetes and macrosomia. Although the association in this study was not statistically significant, the trend aligns with existing evidence suggesting that pre-pregnancy BMI plays a vital role in influencing GWG and subsequent pregnancy outcomes.

Interestingly, no significant associations were found between GWG, nutritional supplements, or sociodemographic factors and birth outcomes. This is consistent with findings from Asefa et al. (2020), who reported no significant difference in risks of pre-eclampsia or macrosomia between women with inadequate and adequate GWG. Similarly, Adeoye et al. (2023) found that although excessive GWG is prevalent in some populations, it does not consistently predict adverse outcomes. These findings suggest that the relationship between GWG and birth outcomes is complex and may vary depending on population characteristics and methodologies.

The data revealed that nearly half of the participants gained 0–5 kg during pregnancy, with a mean GWG of 5.94 kg, which is lower than the recommended guidelines. Studies by Bhavadharini et al. (2017) and Wang et al. (2021) have emphasised that both inadequate and excessive GWG can lead to complications, such as macrosomia, preterm birth, and caesarean sections. While this study did not find strong associations between GWG and birth weight or gestational age, existing literature stresses the importance of adhering to recommended GWG ranges to optimise maternal and neonatal health outcomes.

The lack of significant findings for several factors in the regression analysis may reflect the heterogeneity of the study population, variation in GWG categories, and differences in methodologies. According to Niyi et al. (2024), inadequate GWG is associated with higher risks of premature delivery and a lower likelihood of caesarean sections, whereas excessive GWG increases the risks of macrosomia and caesarean sections. These results underscore the need for targeted interventions and consistent monitoring of GWG throughout pregnancy to mitigate risks associated with adverse maternal and neonatal outcomes.

**CHAPTER FIVE**

**CONCLUSION AND RECOMMENDATION**

**Conclusion**

This study explored the dietary patterns, micronutrient supplementation, and gestational weight gain (GWG) among pregnant women and their association with birth outcomes. The results revealed two primary dietary patterns: healthy and unhealthy. However, the study found no significant correlation between dietary patterns and birth weight, with the exception of a marginal association with leafy vegetable intake. Micronutrient supplementation followed a general pattern (iron, folic acid, multivitamins) and a specific pattern (vitamin D, calcium), reflecting socio-economic influences. However, these supplements did not significantly affect birth outcomes, suggesting the need for a more integrated intervention in maternal nutrition and supplementation strategies.

GWG emerged as a key predictor of birth outcomes, reinforcing its critical role in maternal and neonatal health. While pre-pregnancy BMI and the amount of physical activity had weak links with birth outcomes, the fact that GWG and supplementation did not show any significant links suggests that there are many factors that interact with each other to affect pregnancy outcomes. This study highlights the need for targeted, individualised nutritional interventions that consider socio-economic status, physical activity, and pre-pregnancy health to improve maternal and neonatal health. The study, however, did not determine the mechanisms behind these asscocations. Further research is required to determine the mechanisms behind these associations, particularly in diverse populations and settings.

**Recommendation(s)**

**Policy Recommendations**

1. The Ministry of Health and donor funders should develop national guidelines to promote balanced diets and micronutrient supplementation during pregnancy. This will ensure a unified approach to improving maternal nutrition, leading to better pregnancy and birth outcomes.
2. The Ministry of Health and Donor Funders should allocate funds for maternal health programs focused on nutrition education and improving access to affordable healthy foods and supplements, particularly in rural areas. Increased funding will expand access to nutritional support for pregnant women, especially in underserved regions, reducing maternal and neonatal health disparities.
3. Ghana Health Service, Christian Health Association of Ghana (CHAG), and Implementing Partners should collaborate with the Physiotherapy Association to develop and disseminate standardised guidelines for safe physical activity during pregnancy. This will promote safe exercise practices, potentially reducing the risk of adverse pregnancy outcomes related to inactivity or overexertion.

**Practice Recommendations**

1. Health facilies should encouraged pregnant women to adopt a balanced diet, emphasising vegetables and whole grains while reducing their intake of fast foods and sugary beverages. Encouraging healthier eating habits can reduce the risk of malnutrition and its related complications during pregnancy.
2. Pregnant women should engage in moderate physical activity, guided by individualised health advice from healthcare professionals. Moderate exercise can help improve maternal health and lower the risk of conditions like gestational diabetes and preeclampsia.
3. Health facilities should integrate nutrition counselling into routine antenatal care and ensure the consistent provision of iron, folic acid, and essential supplements to promote healthy eating and appropriate gestational weight gain. This integration will ensure timely interventions, reducing the risk of micronutrient deficiencies and supporting optimal foetal development.
4. Health facilities should enhance community-based health programs, empowering pregnant women through locally-led nutrition education initiatives delivered by community health workers. Empowering women at the community level will improve nutritional knowledge, leading to healthier dietary practices and better birth outcomes.