# Concordance of fasting plasma glucose among nondiabetic married couples

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**BACKGROUND:** This study was done to find out the concordance of fasting plasma glucose among couples and to study the concordance of various factors which affect fasting blood glucose concordance. **METHODOLOGY:** This was a community based cross-sectional study conducted in an urban area of Nagpur. The study population comprised 208 couples with both husband and wife of age 30 years or more; for inclusion in the study both partners also had to be nondiabetic. Detailed dietary history was taken and current habits regarding physical activity and lifetime stress were assessed. Anthropometric indices were measured. Fasting plasma glucose (FPG) was estimated in the morning after prior appointment. **RESULTS:** There was 52.9% concordance of FPG. High concordance was seen in the early period after marriage. Concordance of plasma glucose was not influenced by the concordance of various lifestyle factors among couples. **CONCLUSIONS:** Concordance of various lifestyle factors could not explain the concordance of FPG among couples. This suggests a role for some other shared marital environmental factors, which could affect plasma glucose concordance among couples.

**KEY WORDS:** Concordance, marriage, plasma glucose



Spouse concordance is a state where husband and wife are found to have closely similar attributes.[1] The resemblances come through the process of living together. Thus, individuals who cohabit should show concordance in cardiovascular risk factors.[2] Diabetes mellitus (DM) is one of the most common chronic diseases and is a major contributor to the development of cardiovascular diseases.[3] The American Diabetes Association (ADA) has approved new diagnostic criteria for diabetes mellitus, laying emphasis on fasting plasma glucose (FPG) as the most reliable and convenient test for the diagnosis for DM in asymptomatic individuals.[4] ADA has classified glucose tolerance into three categories based on FPG: FPG <110 mg/dl is considered normal, FPG >110 mg/dl but <126 mg/dl is defined as impaired fasting glucose (IFG), and FPG >126 mg/dl warrants the diagnosis of DM.

Since spouse-pairs are persons sharing a similar environment but having minimal genetic similarity, analysis of concordance of FPG among them would reveal environmental factors contributing to DM. Such studies might also provide a rationale both for case finding and for environmental modification. As compared to American samples, relatively little is known about marital aggregation of blood sugar in non-Western countries, where differences in lifestyles may affect the expression of traits differently. A feature that distinguishes Western societies from many Indian groups is the homogeneity among family members for many environmental covariates.

We report here a community-based study of spouse concordance for FPG among 208 married couples; we included marriages of both short and long duration.

## Methodology

This cross-sectional, community-based study was conducted from May 2004 to April 2005 in Jaripatka, which is an urban area under Nagpur Municipal Corporation. This area was selected for feasibility. The Ethics Committee of Indira Gandhi Government Medical College approved the study.

The findings of the present report are from a survey done

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to study factors associated with concordance of blood pressure among couples. The sample size estimated in that study, based upon proportion of concordance in the pilot study, was 260 couples. Study subjects were married couples, where both husband and wife were of the age of 30 years or more. Couples in whom the wife was pregnant and those in whom either one or both partners had secondary hypertension were excluded. Fifty-two couples in whom either one or both spouses were known cases of diabetes were excluded from the present analysis. A house-to-house survey was carried out. It was decided to start with the first house and cover all the houses till the required sample was obtained. Informed consent was obtained in writing from the head of the household and the study subjects after explaining to them the objectives of the study.

Detailed history regarding sociodemographic characteristics was recorded in a predesigned, pretested proforma. Dietary history was taken by the 24-h recall method. Visible fat intake per day was then estimated as per ICMR guidelines.[5] Level of salt consumption was assessed based on the subject's rough estimation of intake: i.e., low (seldom or never), moderate (if needed, after tasting the food), or high (routinely, before tasting the food) salt addition during meals.[6] Current habits regarding physical activity (occupational and leisure-time) were assessed and graded as light, moderate, and heavy.[7] Stress was assessed by a self-administered questionnaire,[8] which was to be filled separately by both spouses. Anthropometric indices including height, weight, waist circumference, and hip circumference were measured according to the recommended techniques[9]. Body mass index (BMI) and waist–hip ratio (WHR) were calculated. A BMI value of 25 to 30 was defined as overweight and a value 30 and over as obese.[10] The criteria for truncal obesity was a WHR > 0.92 for husbands and WHR > 0.85 for wives.[10] FPG estimation was done early in the morning after an overnight fast, using Sure Step-Plus Blood Glucose Meter (LIFE SCAN).

**Criteria for concordance of various factors**

*Education:* Both spouses having same level of education, i.e., <12, 12–15, or >15.

*Type of diet*: Both spouses consuming the same diet, i.e., either vegetarian or a mixed diet.

*Visible fat consumption*: Both spouses having similar fat intake, i.e., <20 or ≥20 gm/day.

*Salt consumption:* Both spouses having similar level of salt consumption, i.e., either 'low' or 'moderate to high.'

*Physical activity*: Both spouses having the same level of physical activity, i.e., 'light' or 'moderate to heavy' physical activity.

*Body mass index:* Both spouses having the same BMI level, i.e., <25, 25–30, or ≥30.

*Truncal obesity:* Presence or absence of truncal obesity in both spouses.

*Stress:* Both spouses having the same number of lifetime events, i.e., <10 or ≥ 10.

*Fasting plasma glucose:* Both spouses having the same level of FPG, i.e., <110, >110 but <126, or >126 mg/dl.

**Statistics**

Percentage, mean and standard deviations were calculated. Association was tested by applying the Chi-square test.

## Results and Discussion

All the couples were of Hindu religion. As expected, husbands were older as compared to wives. Eighty-six percent of husbands and seventy-six percent of wives were educated at least up to the tenth standard. The majority of our study population (80%) belonged to the higher socioeconomic strata [Table 1].

**Table 1: Characteristics of study population**

| Characteristics | Husbands (*n*=208) | Wives (*n*=208) |
|---|---|---|
| Age group (years) | | |
| 30-40 | 45 (21.6) | 86 (41.4) |
| 40-50 | 82 (39.5) | 83 (39.9) |
| 50-60 | 55 (26.4) | 33 (15.7) |
| ≥ 60 | 26 (12.5) | 6 (3.0) |
| Educational status (years of education) | | |
| < 10 | 29 (13.9) | 50 (24.1) |
| 10-12 | 97 (46.6) | 108 (51.8) |
| > 12 | 82 (39.5) | 50 (24.1) |
| Socioeconomic status | | |
| Upper | 11 (5.3) | 11 (5.3) |
| Upper middle | 155 (74.6) | 155 (74.6) |
| Lower middle | 28 (13.5) | 28 (13.5) |
| Upper lower | 14 (6.6) | 14 (6.6) |

Numbers in parenthesis indicate percentages.

Among our study subjects 70.7% of the couples had been married for 10–30 years [Table 2]. The minimum and maximum duration of marriage was found to be 6 months and 57 years, respectively. The mean FPG was lower for wives than for husbands in all marriage duration groups, except in those married for 30 years or more, which reflects the role of postmenopausal factors at this stage of life.

Concordance of FPG was seen among 110 (52.9%) couples [Table 3]. Concordance was high at the lower levels of FPG. No trend was observed in concordance of FPG with duration of marriage. Similar to the findings reported by Barrett-Connor *et al.*,[11] high concordance was seen in the earlier decades of marriage, which may be due to assortative mating among spouses. Concordance of various factors ranged from 46.2% (for BMI) to as high as 88.5% (for visible fat consumption). Concordance for dietary factors was very high among couples. Concordance of all these factors did not explain the concordance of FPG among couples [Table 4]. Our findings are consistent with those reported by Barrett-Connor *et al.*[11] Literature search did not reveal any studies regarding consanguinity of FPG in our population, so we do not have figures for comparison in our population. To see whether the observed concordance was real or not, we did pairing of husband with husband and wife with wife. This revealed only 25-30% concordance and this was similar at different levels of FPG. Also, since we did not have non husband-wife pairs for comparison from the population, we performed a 'spouse-swapping' experiment, in which each husband was randomly assigned someone else's wife for seeing if there was concordance of FPG. This also showed a similar concordance, i.e., below 30%. Sackett *et al.*,[12] had analyzed data using this 'spouse-swapping' technique and they found that random pairs failed to exhibit the concordance of systolic or diastolic blood pressure that is found among true spouse pairs. This suggests a role for some other unknown shared marital environmental factor which could affect concordance of FPG among couples. Moreover, as reported by Khan *et al.*,[13] there is an increased risk of glucose intolerance and type 2 diabetes in spouses of patients with type 2 diabetes. Thus, lifestyle interventions that specifically target the marital partners as a unit may be more efficacious than individual patient education strategies for prevention and control of conditions like DM. Further research on concordance of FPG among couples should be done to explore new variables in order to shed light on the unidentified shared environmental factors that account for the concordance.

**Table 2: Mean fasting plasma glucose of husbands and wives according to duration of marriage**

| Duration of marriage (years) | No. of couples (%) | Mean FPG (SD) (mg/dl) | |
|---|---|---|---|
| | | Husbands | Wives |
| < 10 | 21 (10.1) | 118.0 (23.2) | 113.1 (33.3) |
| 10-20 | 72 (34.6) | 113.6 (41.2) | 112.7 (35.4) |
| 20-30 | 75 (36.1) | 117.1 (32.4) | 111.6 (12.8) |
| ≥ 30 | 40 (19.2) | 114.9 (24.6) | 117.6 (27.5) |
| Total | 208 (100.0) | 114.5 (33.6) | 113.3 (27.3) |

FPG - Fasting plasma glucose

**Table 3: Mean fasting plasma glucose of husbands and wives according to duration of marriage**

| Duration of Marriage (years) | No. of couples | < 110 | >110 but <126 | >126 | Total |
|---|---|---|---|---|---|
| < 10 | 21 | 8 (38.1) | 3 (14.3) | 0 | 11 (52.4) |
| 10-20 | 72 | 31 (43.1) | 12 (16.7) | 5 (6.9) | 48 (66.7) |
| 20-30 | 75 | 20 (26.7) | 9 (12.0) | 3 (4.0) | 32 (42.7) |
| ≥ 30 | 40 | 8 (20.0) | 6 (0.0 ) | 5 (12.5) | 19 (47.5) |
| Total | 208 | 67 (32.2) | 30 (14.4) | 13 (6.3) | 110 (52.9) |

Numbers in parenthesis indicate percentages

**Table 4: Concordance of factors associated with concordance of fasting plasma glucose among couples**

| Factors | Concordance of other factors (*n* = 208) | Concordance of FPG (*n* = 98) | $\chi^2$, df, *P* value |
|---|---|---|---|
| Education | 121 (58.2) | 65 (53.7) | 0.08, 1, >0.05 |
| Type of diet | 160 (76.9) | 81 (50.6) | 1.42, 1, >0.05 |
| Visible fat consumption | 184 (88.5) | 95 (51.6) | 1.01, 1, >0.05 |
| Salt consumption | 163 (78.4) | 90 (55.2) | 1.64, 1, >0.05 |
| Physical activity | 162 (77.9) | 83 (51.2) | 0.80, 1, >0.05 |
| Body mass index | 96 (46.2) | 53 (55.2) | 0.39, 1, >0.05 |
| Truncal obesity (WHR) | 108 (51.9) | 60 (55.6) | 0.64, 1, >0.05 |
| Lifetime stress events | 174 (83.7) | 94 (54.0) | 0.55, 1, >0.05 |

*Figures in parentheses indicate percentages, FPG - Fasting plasma glucose

## References


1. Haynes SG, Eaker ED, Feinleib M. Spouse behaviour and coronary heart disease in men: Prospective results from the Framinghan Heart Study, I: Concordance of risk factors and the relationship of psychosocial status to coronary incidence. Am J Epidemiol 1983;118:1-22.
2. Knuiman MW, Divitini ML, Bartholomew HC, Welborn TA. Spouse correlations in cardiovascular risk factors and the effect of marriage duration. Am J Epidemiol 1996;143:48-53.
3. Samanta BB. Prevalence of diabetes and impaired fasting glucose in newly detected hypertensives using American Diabetes Association Criteria. Indian Med Gazette 2003;137:174-7.
4. Report of the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus. Diabetes Care 1997;20:1183-97.
5. Gopalan C, Rama Shastri BV, Balasubramaniam SC. Nutritive value of Indian foods. NIN, ICMR: Hyderabad; 2000.
6. Little P, Girling G, Hasler A, Trafford A, Craven A. A controlled trail of a low sodium, low fat, high fibre diet in treated hypertensive patients. The efficacy of multiple dietary interventions. Postgrad Med J 1990;66:616-21.
7. Retrospective activity questionnaire. Chapter 15, Habitual physical activity and health. WHO: 1976. p. 150-3.
8. Singh G, Kaur D, Kaur H. Presumptive stressful life event scale (PSLES): A new stressful life events scale for use in India. India J Psychiatry 1984;26:107-14.
9. Dowse GK, Zimmet P. A model protocol for a diabetes and other non-communicable diseases field survey. World Health Stat Q 1992;45:360-72.
10. WHO Technical Report Series. Obesity: Preventing and managing the global epidemic, 2002. No.894.
11. Barrett-Connor E, Suarez L. Spouse concordance for fasting plasma glucose in non-diabetics. Am J Epidemiol 1982;116:475-81.
12. Sackett DL, Anderson GD, Milner R, Feinleib M, Kannel WB. Concordance for coronary risk factors among spouses. Circulation 1975;52:589-95.
13. Khan A, Laskar SS, Chowdhury TA. Are spouses of patients with type 2 diabetes at increased risk of developing diabetes? Diabetes Care 2003;26:710-2.


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