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Original Research Article

Fasting Insulin and Glucose Concentrations among Adult Males of the Native Mising Population of Assam

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ABSTRACT

Introduction: The fasting Insulin and Glucose levels are very good indicators of an individuals' glucose metabolic status. Glucose metabolism among different ethnic groups may vary due to difference in genetic makeup as well as their lifestyles. A study was carried out on a specific ethnic group called "*Mising tribe*" of Assam, to evaluate metabolic status in this unique population.
Methods: In this work, the fasting serum Insulin and plasma Glucose were recorded for a group of 50 randomly selected non-diabetic males of the indigenous *Mising* tribe of upper Assam, of the age group 40-50 years. Their biophysical profiles and their physical activity status were recorded and compared with their fasting Insulin and Glucose levels.
Result: The mean fasting serum insulin was found to be 13.6 ±4.62µU/ml, mean fasting glucose was 98.39 ± 6.74 mg/dl, the mean fasting insulin: glucose ratio in our study was 0.121 ± 0.07 which is again within the normal range (i.e. < 0.4), comparable to the findings of other workers. The fasting insulin levels were found to be inversely proportional to the Physical activity status.
Conclusion: Sedentary, so called urban lifestyle maybe associated with higher fasting Insulin levels, which might have a strong role in the etiopathogenesis of pre-dominantly urban diseases like diabetes, obesity and cancers.

Key Words: Insulin, Insulin: Glucose ratio, *Mising* tribe, Modified Activity Questionnaire (MAQ)

INTRODUCTION

Insulin, the protein proved to have hormonal action, secreted by the islet of Langerhans of pancreas is directly related to several diseases. On one hand, ageing, poor diet, stress among other factors can deprive cells of their Insulin sensitivity producing Diabetes Mellitus; on the other hand, as a result of insulin resistance, the pancreas produces more insulin than normal so there are higher levels of

Insulin circulating in the bloodstream or hyperinsulinemia. Hyperinsulinemia and insulin resistance may lead to several problems, including elevated triglycerides, [1-4] low HDL, [5,6] type II diabetes, [7-9] and obesity. [10-13]

Regular exercise and active lifestyle is known to improve glycemic control, delay the onset or even prevent Diabetes mellitus.

The *Mising* tribe is an isolated, hardworking, ethnic, native population of upper Assam. No published data is available on their Biophysical profiles and Physical activity status. So we wanted to study the levels of fasting Insulin and Glucose levels in this indigenous population, and correlate these levels with their Biophysical profiles and physical activity status, since this could throw some light on the role of regular physical activity on the pathophysiology of lifestyle based metabolic diseases.

MATERIALS AND METHODS

The '*Misings'* are one of the colorful Mongoloid Tribes of the north-east India. They have their own history of origin, socio-cultural life and language. This ethnic group from N-E region were previously known as *'Miris'*; they are mentioned as such in the list of schedule tribes of India under constitution order 1950. The present study was conducted among the male members of this group in *Mising* dominated villages of upper Assam, namely

- Natun Chiring Gaon, P.O. & District Dibrugarh
- Pani Miri Gaon, P.O. Kolakhowa Chariali, District Dibrugarh

The study was conducted during the period June to July 2013, in Assam Medical College and Hospital, Dibrugarh, Assam and Subharti Medical College, Meerut, Uttar Pradesh.

The sample size was calculated after knowing the total population of male *Mising* persons in the age group of 40-50 years in *Mising* dominated villages, where the study was carried out. As the proposed study was a prevalence study, a 10% sample from the targeted population was adequate to achieve the objective of the study.

The number of missing populated villages of the region was identified and from these villages cases were selected by the random process and thereafter consecutive house in clockwise direction chosen for the purpose of selecting the subjects.

Only healthy male *Mising* subjects between 40-50 years were included in this study. Subjects with diabetes mellitus, any form of malignancy and first degree family history of diabetes mellitus were excluded.

A home visit was made prior to sample collection and the purpose of visit and procedure of testing was explained. An informed consent for participating in the test was recorded. The name, age, height, weight and other biophysical parameters, family history suggestive of Diabetes, Thyroid disorders, Pancreatitis, Jaundice and other relevant details were recorded in a proforma developed for the purpose. Subjects known to be having diabetes and or on treatment were excluded from the study.

Blood pressure was measured using a mercury sphygmomanometer in comfortable sitting position in the right arm.

Sample Collection and Biochemical testing:

The subjects were instructed to stay in fasting state for the early

morning venous blood sample to be collected on the decided day. With aseptic precautions (A) 2ml venous blood in polystyrene tube of 25mm x 75mm size for insulin estimation and (B) 2ml venous blood in NaF vial for glucose estimation were collected from antecubital vein after overnight fasting (at least 8 hours).

Sample after collection:

A. For insulin estimation, the serum was kept at room temperature and allowed to clot. Centrifugation was done, the serum was collected in a separate vial and preserved at -20^{0}C at Dept of Biochemistry, Assam Medical College, Dibrugarh. The sample collection of the entire study group was done over a span of 4 days, then the collected serum were transferred to portable vaccine carrier to avoid denaturation of protein. They were brought to Subharti Medical College, Meerut by air and Insulin was estimated in a *ROBONIK* ELISA washer and reader, using solid phase sandwich ELISA diagnostic kits (EIA 2935) from DRG Germany, on the same day.
B. For the estimation of blood sugar 2ml blood collected in NaF vials were centrifuged at 5000 RPM for 10 mins and the plasma was used for estimation of Glucose by GOD-POD method, using Glucose estimation kit from *SPAN*, in a Semi-automatic analyzer within 6 hours of collection, at Dept of Biochemistry, Assam Medical College, Dibrugarh.

Assessment of Physical activity:

The Modified Activity Questionnaire (MAQ), [14] adapted from the Pima Indian Questionnaire, for suitability and appropriateness of the various indigenous physical activities undertaken by the population under study, was filled to assess the physical activity status of the selected individuals. The MAQ has been shown to be both reliable and valid for adults. [15] The occupational and leisure estimates calculated from this comprehensive interviewer-administered questionnaire can be combined to arrive at an overall estimate of physical activity levels. The MAQ can estimate the individual's physical activity level over the past one year, expressed as hours per week, by a crude estimate of the metabolic cost of each activity undertaken and expressed as MET hours per week. The MET is the ratio of working metabolic rate of an activity divided by the resting metabolic rate.

The MAQ used in this study, as well as detailed instructions for administrating the questionnaire and calculating the results can be found in "A Collection of Physical Activity Questionnaires for Health-Related Research". [15]

RESULTS

This present community based cross-sectional study includes 50 healthy male subjects, within the age group of 40-50 years, of the isolated tribal *Mising* population of upper Assam. In this study a survey of biochemical profiles on glucose and insulin in basal state and their variation with physical activity status among members of this isolated tribal population has been conducted.

The following tables illustrate the results of this study:

Table 1: Mean Fasting Serum Insulin level (μU/ml), Mean Fasting Blood Glucose Level (mg/dl), and Mean Fasting Insulin: Glucose ratio of 50 subjects, based on their occupation.

Groups	Total no of subjects	Fasting Insulin (μU/ml)	Fasting Blood Glucose (mg/dl)	Fasting Insulin: Glucose Ratio
Service	12	12.78 (±8.36)	107.92 ±19.83	0.201 (±0.083)
Cultivators	38	10.18 (±7.92)	96 ±9.23	0.158 (±0.069)

Table 2: Comparison between subjects with family history (F/H) and without family history of Diabetes Mellitus (DM) (not 1st degree relative).

Groups	Total no of subjects	Fasting Insulin (μU/ml)	Fasting Blood Glucose (mg/dl)	Fasting Insulin: Glucose Ratio
Subjects having family history of Diabetes Mellitus	5	13.95 ± 12.54	115 ± 6.96	0.214 ± 0.14
Subjects without family history of Diabetes Mellitus	45	10.45 ± 6.08	97.28 ± 6.37	0.117 ± 0.07
		P < 0.01	P is 0.001	P < 0.05

Table 2 shows the comparison between the two groups of people having family history of diabetes mellitus and no family history of diabetes mellitus. It is to be noted that subjects having family history were not first degree relatives. It is observed that persons having family history of diabetes mellitus have got higher mean fasting glucose, mean fasting insulin and a mean fasting Insulin:Glucose ratio. The mean difference is almost 10mg/dl in fasting glucose and 9.5 μU/ml in Fasting Insulin. Fasting glucose level shows a very high significance ($p < 0.001$) when compared between subjects with positive family history and negative family history of diabetes mellitus, while fasting insulin level is found to be highly significant ($p < 0.01$).

Table 3: Shows the mean values of Fasting insulin, Fasting glucose and Fasting Insulin:Glucose ratio, compared between mild hypertensive and normotensive subjects, there are little difference in these values carrying no significance ($p>0.05$).

Groups	Total no of subjects	Fasting Insulin (μU/ml)	Fasting Blood Glucose (mg/dl)	Fasting Insulin: Glucose Ratio
Hypertensive	5	11.43 ± 7.25	102.2 ± 5.16	0.140 ± 0.080
Normotensive	45	10.73 ± 6.78	98.49 ± 6.81	0.121 ± 0.076
		p>0.05	p>0.05	p>0.05

Among the 50 subjects in the present study, 5 subjects are found to be hypertensive, taking cut-off value as 140/90mmHg, the rest 45 were normotensive.

Table 4: Shows comparison of mean Fasting Insulin, Fasting Glucose and Fasting Insulin:Glucose ratio with corresponding Body mass Index.

Groups BMI (kg/m^2)	Total no of subjects	Fasting Insulin (μU/ml)	Fasting Blood Glucose (mg/dl)	Fasting Insulin: Glucose Ratio
(A) 22.1-25	30	11.03±6.67	98.88±6.38	0.123±0.074
(B) < 22	17	9.93±7.27	97.61±7.24	0.119±0.083
(C) > 25	3	13.70±5.55	105.16±7.22	0.128±0.065

p>0.05 for Fasting Glucose (A Vs. B) *p>0.05 for Fasting Glucose (A Vs. C)*
p>0.05 for Fasting Insulin (A Vs. B) *p>0.05 for Fasting Insulin (A Vs. C)*
p>0.01 for Fasting I:G ratio (A Vs. B) *p>0.05 for Fasting I:G ratio (A Vs. C)*

It is observed that the values of mean fasting glucose gradually increasing from Group-B to A and A to C. Again mean fasting insulin values between A and C are almost same but it is little bit lower in Group-B. Similarly there is almost same value of insulin: glucose ratio between A & C, but slight lower value in Group-B.

Statistically, it has been observed that there are no significant ($p > 0.05$) relationship between mean fasting glucose and mean fasting insulin levels when group A is compared with group B or C. Similarly, no significance ($p > 0.05$) is observed in their glucose: insulin ratio also.

Table 5: Shows the comparison among subjects performing various amount of physical activity, which has been recorded as per the modified PIMA Indian questionnaire. The Group D subjects have activity >20 MET hours, Group E: 15-20 MET hours, Group F: < 15 MET hours per week. The commonly undertaken work related activity was agriculture related, while leisure activities included bicycling, u8walking, chopping wood, carrying water, rearing animals (cows and pigs), gardening and sporting activities.

Activity Status	No of Subject	Physical Activity (hours per wk)#		Mean Fasting Glucose	Mean Fasting Insulin	Mean I:G Ratio
		Work	Leisure			
Heavy (D)	36	13.1	8.2	96.99± 9.23	9.82±4.93	0.087±0.069
Moderate (E)	10	9.2	6.5	99.65± 6.89	12.19±6.33	0.112±0.071
Mild (F)	4	6.9	5.6	113.66±7.34	16.2± 7.43	0.164± 0.081

 # median hours/week activity average over past one year.
p>0.05 for glucose (F Vs. E) *p>0.05 for glucose (F Vs. D)*
p<0.01 for insulin (F Vs. E) *p<0.05 for insulin (F Vs. D)*
p<0.01 for I:G ratio (F Vs. E) p<0.05 for I:G ratio (F Vs. D)

Statistically it gives no significance for fasting glucose ($p > 0.050$) when subjects of group (D) were compared with group (E) or group (F). But there is high significance ($p < 0.01$) for fasting insulin level when Group-D was compared with F and significant correlation ($p < 0.05$) when compared with group E. Again for insulin: glucose ratios show high significant variation ($p < 0.01$) when Group-D is compared with F and significant ($p < 0.05$) correlation when compared with Group-E.

Also, on comparing the recorded total physical activity values (MET) with fasting glucose levels we find a clear trend of worsening fasting glucose with decreasing physical activity levels among the study group.

DISCUSSION

This study is a unique work, since it is an endeavor to investigate the metabolic status of the indigenous ethnic native population of upper Assam- the *Mising* tribe, by simultaneously estimating Insulin and Glucose levels in the fasting state and correlate the same with their physical activity status. There are some studies done on their food habits and social setup, [16] but no information is available on the Insulin levels, Fasting blood glucose levels and its correlation with Body Mass Index and Physical Activity status of this population. This study also throws light upon the ill effects of so-called urban sedentary lifestyle, where food, water and other essentials are easily available, on metabolism of Glucose. [17-19] The population included in this study, is a typical example of people who are undergoing a rapid lifestyle change, from having cultivation and hunting as their mainstay occupation, some are switching to office jobs, shifting to urban areas and adopting lifestyle which might involve more mental and psychological stress but much less physical activity. Probably as a consequence of this, we found a higher level of circulating insulin in this sub-group, compared to their farming counterparts, similar to other studies. [20-22] Moreover, the socioeconomic status of cultivator group is also lower than the service group which may be another factor. Our results are similar to what the previous workers had shown, that there exists and inverse relationship between socioeconomic status and the prevalence of diabetes. [23]

Since we have excluded subjects with diabetes or with diabetic first degree relative, the fasting Glucose levels in all subjects studied were within the normal reference range.

The incidence of positive family history of diabetes mellitus (other than 1st degree relatives) was 5%. This incidence seems to be low compared to in other studied communities like Parsees and Sikhs. This is probably due to non-prevalence of inter-caste marriages among the *Misings*.

Ingestion and absorption of dietary Glucose triggers the release of a burst of the peptide Insulin which enables Glucose uptake by liver and muscle cells. Once glucose has been shifted inside cells for storage or energy release, insulin levels should drop to very low or even to undetectable levels. [(24)] Only a tiny amount of basal insulin is required for glucose homeostasis. In our study, we found that among the people with weekly physical activity more than 20 MET hours, the mean fasting Insulin was 9.82±4.93 µIU/mL. But for people with less than 15 MET hours activity per week, the mean fasting Insulin was 16.2±7.43 µIU/mL. Insulin being a strongly anabolic hormone, high levels can promote cell growth, predisposing to certain cancers. [(25-29)] Higher Insulin levels also trigger the synthesis of beta-amyloid proteins in brain and may contribute to the development of Alzheimer's disease. [(30)] Overproduction of Insulin is even a contributory factor to prostate enlargement because of its effects in promoting the overgrowth of prostate cells. [(31)] Therefore several of these so called urban diseases, may have a very intricate lifestyle based etiopathogenesis.

The study of 'Fasting Insulin and Glucose concentrations among adult males of the native Mising population of Assam' is a preliminary one, carried out among a small section of missing community. So, it is thought that there are reasonable scope for further studies in this field which would uphold new vistas for a better understanding of the etio-pathogenesis and prevention of highly prevalent so called urban non-communicable diseases like Diabetes Mellitus and Obesity.

CONCLUSION

A physically active lifestyle is an absolute must to prevent metabolic diseases like diabetes mellitus and obesity; or to delay the onset or slow the progression of degenerative diseases and cancer.

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