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Socio-economic Status among Diabetes in Pune

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ABSTRACT As there is marked increase in incidence of Type 2 Diabetes in India, primarily, due to rapid changes in lifestyles in different socio-cultural and ethnic groups, an anthropological study of 750 diabetic patients was carried out in Western part of India with the help of structured questionnaires, in-depth interviews and statistical calculations. The diagnosis was based on 'WHO criteria from K.E.M, AFMC, Sassoon Hospital, Poona Hospital, Nandadeep Hospital within Pune city. Maximum numbers of patients were Marathas, the Warrior Class followed by Brahmins, Backward Caste, Others. The diabetics though had some sort of formal education but had low awareness about the disease, ignorance about their healthy diet pattern and belonged to Class II category with mixed type of work pattern of both sedentary and non-sedentary. All these might have contributed to deterioration of glucose metabolism coupled with stress, resulted in incidence of Type 2 Diabetes. Hence further studies are required to evaluate the various epidemiological and environmental factors, dietary patterns, socio-cultural and economic status, influencing incidence and distribution of diabetes in different parts of ethnic groups of India.

INTRODUCTION

It had been estimated that in India, the increase in Type 2 Diabetes would be 58% increase from 51 million people in 2010 to 87 million in 2030 (Snehalatha and Ramachnadaran 2009). This increase will be primarily due to the rapid changes in lifestyles, socio-economic status, environmental factors, diet coupled with physical inactivity. For example in Asian countries like Vietnam, due to change in the socio-economic status, there had been rapid changes in the society, which had resulted in polarization of the disease pattern, with under nutrition and its related diseases co-existing with chronic diseases like diabetes and obesity (Khoi 1996; Loan and Hung 2002). In Pakistan, (Nisar et al. 2008), nearly half (44%) of the Pakistani subjects were found to have high risk of Type 2 Diabetes by Risk Assessment Score which was basically due to poor dietary habits, lack of physical activity and low educational level. Although quite a number of studies suggested several risk factors for diabetes, there are very few or negligible studies were carried out investigating cultural, socio-economic risk factors for diabetes in specific ethnic groups or community settings in India. Since the disease exerts particularly heavy health and economic burden on the society, the present study aimed to investigate the impact of socio-cultural, economic and lifestyle factors as risk factors of Type 2 Diabetes Mellitus in the western part of India.

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MATERIAL AND METHODS

Study Population

A study of 750 Type 2 Diabetic patients was carried out by the researcher for the study who had clinical symptoms of Type 2 Diabetes. Since the controls were the subjects who accompanied the patients in the hospitals during the OPDs, no special or marked difference was found in the lifestyle factors, and hence no data as such for socio-economic status of the control was taken. The data comprised of males (N = 487) than females (N=263) diabetic patients whose age ranged 30 years and above. The patients hailed from different communities, ethnic groups and castes with varied socio-cultural, economic status, located in different geographical areas of India. Majorities, were, local Maharashtrians (local Marathi speaking people from Western India) of indigenous groups that included Marathas, Brahmins, Backward Castes (BC). The 'Others' included Marwaris, Gujaratis, Punjabis, Sindhis, Bengalis who were non-Maharashtrians, hailed from different parts of India, but settled in Pune. These people were basically businessman, apart from being the working class.

Methodology and Study Design

The diagnosis of the disease was based on 'WHO criteria of Diagnosis of Type 2 diabetes, (WHO 1998) and as per confirmed by the doctors. The Data was collected from K.E.M (King Edward Memorial Hospital), AFMC (Armed Force Medical College), Sassoon Hospital, Poona Hospital and Nandadeep Hospital from Pune city located in Maharashtra. A written informed consent letter was obtained by the researcher from all participants who had willingly taken part in the research work. Structured questionnaires, in-depth interviews, statistical analysis (Singh and Bhasin 1989) were used for the study. Each patient was interviewed individually and later with their family members. The patients were not repeated again for the same patient on whom data was collected once. Since the focus of the present study was Type 2 Diabetes Mellitus which normally manifests itself in Middle Ages, data was collected on male and female subjects who were above the age of 30 years. Exclusion criteria were of subjects with Type 1 diabetes, Impaired Glucose Tolerance (IGT), and diabetes due to any other disease category.

Assessment of Socio-economic Status

The socio-economic status was assessed as the level of education, household income and occupational status of each patient. The patients were classified into four groups: illiterates having no formal education, had primarily education, had secondary, higher secondary education and finally the group of graduates and above. Since the study was carried out in Indian society, 'Kuppuswamy's Scale for Classification', with updated income level (Kumar and associates 2007) was used to study and was grouped as Class I, Class II, Class III and Class IV. This 'Kuppuswamy's Scale for Classification' is an updated version of Kuppuswamy's socio-economic scale where education and occupation remained the same but there is an updating of the income range since 1998 and on yearly basis including 2007 to 2012.

In the present study, Class I included white collared job-holders such as executives in various multinational companies, and professors and wealthy businessmen. Class II category included the junior office staffs, clerks, junior accountants, receptionists, nurses, officers, senior accountants. Class II patients also included the patients who had small business like grocery shop, cloth stores, agents, etc. These patients (working class and small business men) who belonged to this category cannot be called as totally sedentary as they had their own mixed type of work pattern that included both sedentary and non-sedentary. Class III and Class IV groups included blue collared jobholders such as the office boys, peons, security staffs, waiters, and other workers in the full companies and government offices often working in shifts. They also included the jawans, housemaids and salespersons, vendors.

Statistical Considerations

Conventional statistical methods such as chi-square test (Singh and Bhasin 1989), Kuppuswamy's Scale for Classification were applied and the differences were considered to be statistically significant, $p < 0.01$. Statistical analysis was undertaken using SPSS package.

RESULTS

Ethnic Groups of the Studied Population

The different ethnic groups of the studied population included the Maharashtrians (ethnic people of Maharashtra) such as Marathas (63%), Brahmins (24%), and Backward Caste (10%). The 'Others' (3%) included the non-Maharashtrians belonging to other parts of India from different geographical locations, socio-cultural and economic status, but settled in Pune (3%). They were basically the Punjabis, Gujaratis, Marwaris, Bengalis and Sindhis.

Maximum numbers (63%) of patients belonged to Maratha Caste (Maharashtrians) that originally hailed from Deccan Plateau area of Western India. Marathas or the Maratha caste groups are a blend of the Warrior and Agrarian Classes, speaking Marathi and generally having their roots in Maharashtra. The Marathas however belonged to the Peasantry Class**.** The standard diet of the Maratha patients consisted of *roti* (flat unleavened bread) with pulses (legumes), *desi* (Indian) *ghee* (a class of clarified butter that originated in the Indian subcontinent) and pickles (made up of lots of oil and salt). They also consumed lots of non-vegetari-

an food such as mutton, chicken with spices and oil. Among the poorer patients, a typical meal consisted of *bhakri* (millet bread) with chopped chillies and lentils (pulses) were observed maximum. Rice was served at meals. The Maratha patients basically were working class people as quite a number of them were executives in various multinational companies, gazetted officers, lecturers, professors; but large number of the patients were clerks, agents, junior accountants, receptionists, and many had their small business, whereas few of them were peons, security staffs, waiters, part time workers.

Brahmin caste group patients were second in position (24%) to be diabetic after the Marathas. They acquired the highest social status among the various castes in India. Being the priests of India, they were quite advanced in education. The traditional occupations of the Brahmins were as priests of Hindu temples or at family religious ceremonies, village revenue officials, academicians, astrologer and administrators. A large numbers also practiced Ayurvedic medicine. By diet, the Brahmin patients were lacto vegetarian. The original dishes of the Brahmin patients included the simple *dal varan* (variety of pulses with rice), *Metkut* (mixture of pulses), lots of *desi ghee* (a class of clarified butter that originated in the Indian subcontinent) and pickles (made up of oil and salt). The Brahmins also used special *kala* (black) *masala* (a mixture of different spices to give flavor to the food) in their cooking. Quite a number of the Brahmins were observed consuming non-vegetarian food. Quite a numbers of Brahmins acquired high position such as senior accountants, professors, lecturers, teachers, managers in various MNC companies, whereas majorities of them were found working as clerks, junior accountants, peons, *jawans* (soldiers), part time and full time workers. Few were observed working as housemaids and watchmen.

Backward Caste (BC) formed 10 percent diabetic of the studied population. The patients belonging to the Backward Caste were basically non-vegetarian and consumed lots of non-vegetarian foods such as mutton, chicken, fishes, eggs cooked in spices and oil. Consumption of vegetables and fruits were moderate, more or less with non-vegetarian curries, pickles and rotis (flat unleavened bread).These people had migrated to cities for jobs and education. Today they acquire very high positions, basically in government jobs and also in various MNC companies, whereas equal numbers of them were also found to be working as workers, maids, junior accounts, clerks, vendors, small shopkeepers, watchmen, small businessmen.

The 'Others' (3%) had less number of people to be diabetic and included the 'Bengalis', 'Marwaris', 'Sindhis', 'Punjabis' and 'Gujaratis'. They were basically Working Class and some had small Business. 'Bengali patients' hailed from Eastern parts of India and belonged to an ethnic community of the historic region of Bengal (now divided between Bangladesh and India) in South Asia. The food consumed by these patients consisted of basically non-vegetarian that included chicken, meat, fish and eggs. These people also consumed lots of sweets as part of their basic diet. These patients were basically the Working Class, migrated from West Bengal and other parts of India and settled in Pune in various companies, government jobs, colleges, institutions as professors, lecturers; junior clerks, accountants, office boys and peons, small businessmen, vendors. The next were the Sindhi patients who originated from Sindh, now a province of Pakistan. 'Sindhis' migrated to India as part of the population exchange between India and Pakistan, and few settled in Pune. The 'Sindhi' patients were basically non-vegetarian and consumed foods such as mutton, chicken and saturated fat like desi ghee and oil. The 'Sindhi' patients were typically businessmen, owing shops, cloth stores and were also found as working as agents of various companies. They were found more or less happy going people. The Gujarati patients belonged to Gujarat, which is a state in Western India, above Maharashtra. The Gujarati patients migrated to Pune for business purposes. Jaggery consumption was found to be exceptional in all their diets. They also consumed lots of milk products, ghee, and sweets. Majority of the 'Gujaratis' were businessmen who had grocery shops, cloth stores, showrooms. The 'Punjabis' were an Indo-Aryan ethnic group from South Asia (specifically Pakistan and India) and hailed from Punjab region, which had been host to some of the oldest civilizations in the world including one of the world's first and oldest civilizations, the 'Indus Valley Civilization'. The diet pattern of the Punjabi patients were quite rich with dietary patterns consisting of both vegetarian food like *'Sarson ka Saag'* (a type of leafy vegetable),

'Makaii ki Roti' (bread made out of corn known as '*makai'*) and non-vegetarian food such as chicken, mutton with lots of oil and *desi ghee.* These patients had mixed type of work pattern which included businessmen such as shopkeepers, owners of showrooms, etc., as well as working class people such as executives in various multinational companies, accountants, clerks were some were also found as workers. The 'Marwaris' originally belonged to Marwar region of Rajasthan in India. Marwari patients were basically businessman, salesperson from Rajasthan and had spread to Pune along with others to many regions of India, and even to neighboring countries, as they expanded their business and trade networks. In many locales, 'Marwari' immigrants over time (and, usually involving many generations) have blended in with the regional cultures. These people had mixed diet pattern, consuming more amount of non-vegetarian with lots of oil, spices and saturated fat consumption such as *'desi ghee'* (is a class of clarified butter that originated in the Indian subcontinent), *rotis* (flat unleavened bread) and *parathas* (*rotis* cooked in ghee or butter). Thus, it was observed that the different patients from varied ethnic groups had both sedentary and non-sedentary types of work pattern, lifestyles and rich dietary pattern.

The Educational Status of Patients

The educational status of the studied population was determined by the total numbers of years of formal education of the patients (95%). They were grouped as graduates and above, secondary, higher secondary educated, primary education, and also those who had practically no formal education. Out of the total literates, nearly half (24%) were primary educated, 58% were secondary and higher secondary educated and few (18%) were post-graduates and above (Table 1). The differences for different levels of educational status among the patients were statistically highly significant ($\chi^2 = 74.20^{***}$; $p = 0.001$).

When the education of the patients was observed in different ethnic groups, it was found that out of the 64% of the Marathas, maximum numbers of Marathas were Higher Secondary, Secondary educated (57%) followed by Primary Educated (25%) and 18% were highly qualified. Similarly, for 24% of Brahmins, it was observed that 70% had Secondary, Higher Secondary Education and 25% had Primary Education and only 5% were very well qualified. 10% of the BC reflected that 42 % Higher Secondary Educated and 29% each were Primary Educated patients and highly qualified. 'Others' had only 41% each for Secondary, Higher Secondary Education and 59% for graduates and above out of the two percent of the overall studied population.

Thus, it was observed that, though the majorities of patients had some sort of formal education, the knowledge, distributions, complications about the disease was practically less among majorities of them. Only when they suffered from some serious disorders such as heart attack, kidney failure, etc were admitted to hospitals and became aware of the incidence of diabetes. This concluded of low awareness levels relating to the disease, resulting in high rise in epidemiology of the disease (Table 1).

Table 1: Educational status of the study population

Variables	*Marathas N = 473 (64%)*		*Brahmins N = 180 (24%)*		*BC N = 75 (10%)*		*Others N = 22 (3%)*		*Total (750)*	
	No.	*%*	*No.*	*%*	*No.*	*%*	*No.*	*%*	*No.*	*%*
No formal education (Illiterate)	34	7.20	4	2.00	0	0	38	5.0		
Formal education (Literates)	439	93.0	176	98.0	75	10	22	3.0	712	95.0
Primary Education	108	25.0	44	25.0	22	29.0	0	174	24.0	
Higher secondary and Secondary education	252	57.0	123	70.0	31	42.0	9	41.0	415	58.0
Graduates, Post-graduates and above	79	18.0	9	5.0	22	29.0	13	59.0	123	18.0

The numbers of patients in each age category are represented with their percentages (%). Statistical analysis was performed and the data was found to be statistical significant ($\chi^2 = 74.20^{***}$; $p = 0.001$).

The Socio-economic Status of Patients

Based on the Kuppuswamy's Classification update for socio-economic status (Kumar et al. 2007) the patients were classified as Class I, Class II, Class III and Class 1V. Majority of the patients belonged to Upper Middle Class category (59%). They included the office staffs, clerks, and accountants, receptionists, nurse. They also included gazetted officers and senior accountants. Class II patients also had small business like grocery shop, cloth stores, vegetable shops, small showrooms, small restaurants', agents in various companies, vendors. These patients cannot be called as totally sedentary as they had their own mixed type of work pattern that included both sedentary and non-sedentary. Class I (31%) included white collared jobholders such as senior executives in various multinational companies, wealthy businessmen and professors. These people more or less had sedentary lifestyles. Class III 6% and Class 1V (4%) group included the blue collared jobholders such as the office boys, peons, security staffs, waiters, workers in various companies and government offices often working in shifts. They also included the housemaids and salespersons. It was amazing to observe that these people had comparatively low percentage of diabetes than the Upper Classes. The differences between them were found to be statistically highly significant ($\chi^2 = 34.23^{***}$; p = 0.001).

When, observed in different ethnic groups, it was seen that in the Marathas, the Warrior Class, had maximum numbers of patients were from Class II (62%) followed by Class I category (26%), and Class III (8%) and Class IV (4%). Also among the Brahmins the Class II (58%) was the most to be affected followed by Class I (36%) and Class III (6%). In BC the Class I (51%) was in higher percentage of diabetics than the Class II (43%) which was also considerable in large number. Finally in Others, Class II (15%) was in greater number to be diabetics than the Class I (7%) (see Table 2).

Thus, it was observed that in all the ethnic groups, especially among the Marathas reflected a strong incidence of diabetes among Class II people followed by the Class I and Class III and Class IV in the western part of Indian subcontinent.

DISCUSSION

The prevalence of Type 2 Diabetes has been increasing rapidly and constitutes a significant public health problem in priority. Understanding the risk factors for Type 2 Diabetes in India, is essential for developing programs to prevent and control the disease.

In the present study, the prevalence of diabetes was observed maximum among the Marathas, followed by the Brahmins, BC and Others. The reason for the maximum Marathas to be diabetic could be due to large body stature, aggressive nature as they were originally from the Warrior Class group, coupled with stress due to modernization, urbanization and foods rich in proteins, fats and processed carbohydrates in their dietary patterns. The Brahmins, who were originally the scholars, were on an average very peace loving people and were next to be diabetic. This could be basically due to various stress factors among them to cope of in this modern world as to maintain their status in today's urbanized societies added with their rich traditional dietary patterns of proteins, fats and processed carbohydrates. Among the BC and Others, the

Table 2: Socio-economic status using updated Kuppuswamy's system of classification

Variables	*Total diabetic patients from different ethnic groups*									
	Marathas N = 473 (64%)		*Brahmins N = 180 (24%)*		*BC N = 75 (10%)*		*Others N = 22 (3%)*		*Total (750)*	
	No.	*%*	*No.*	*%*	*No.*	*%*	*No.*	*%*	*No.*	*%*
Class II	293	62.0	104	58.0	32	43.0	15	69.0	444	59.0
Class I	123	26.0	65	36.0	38	51.0	7	31.0	233	31.0
Class III	38	8.0	11	6.0	5	6.00	0	54	6.0	
Class IV	19	4.0	0	0	0	19	4.0			

The numbers of patients in each age category are represented with their percentages (%). Statistical analysis was performed and the data was found to be statistical significant ($\div^2 = 34.23^{***}$; p = 0.001).

percentages of diabetes was quite less as they were more or less contended with their type of job pattern, though maintained a traditional diets of rich food, they had less stress and more or less happy and contended life. Yet few were found to be diabetic but their percentages were quite less. Thus, it was observed that the incidence of diabetes was different in the different ethnic groups in Pune. Earlier studies revealed that incidence of diabetes to be in different ethnic groups in different parts of the world where it was found that the prevalence of diabetes was highest among the Pima Indians, Black, Hispanic and Native American adolescents (Soderberg et al. 2004). The prevalence of diabetes was also different for participants of Indian, Creole and Chinese background in a survey conducted by Soderberg and associates, which indicated that, the increasing prevalence of diabetes was different in different ethnic groups due to various socio-cultural, economic and environmental factors (Soderberg et al. 2004). The regions with the greatest potential increases are Asia and Africa, where diabetes rates are predicted to rise to two or three times than those experienced today. The "top three" countries with the maximum prevalence of diabetes are India, China, and the USA. Large increases in prevalence are also expected, mostly in countries such as Bangladesh, Brazil, Indonesia, Japan, and Pakistan which indicates marked ethnic difference in the incidence of diabetes (Wild 2004). According to Terrero Latino youths have the fastest growing rates of Type 2 diabetes, outpacing other ethnic groups even as diabetes among U.S. youth is at an all-time high (Terrero 2012).

Majorities of the diabetic patients in the study population belonged to Class II category, which were basically the junior and senior office staff, clerks, and accountants. These people also had small business like grocery shop, cloth stores, agents, etc. They also included gazetted officers and senior accountants. These patients belonged to that class who cannot be called as totally sedentary as they had their own mixed type of work pattern that included both sedentary and non-sedentary. Though they all had some sort of formal education, they reflected a very low knowledge pertaining to the incidence, distribution and complications of the disease in India. In India poverty (low economy) and low education seemed to go together where it was observed that illiterates were below poverty line and were malnourished and did not support the hypothesis that people in low socio economic status reflected high incidence of Type 2 Diabetes (Ishizaki et al. 2003). As Class II category had mixed type of work pattern, maximum sufferers of this disease had deterioration of glucose metabolism, and high incidence of diabetes. According to Thomas and associates socio-economic position (SEP) and ethnicity influenced type 2 diabetes mellitus (T2DM) risk in adults where a study was carried out between SEP and T2DM risk factors in UK children of South Asian, black African-Caribbean and white European origin, using the official UK National Statistics Socio-economic Classification (NS-SEC) and assessed the extent to which NS-SEC explained ethnic differences in T2DM risk factors (Thomas et al. 2012). Incident AGM (Abnormal Glucose Metabolism) leading to Diabetes was assessed using fasting plasma glucose and 2-h plasma glucose from oral glucose tolerance tests, and demographic, socioeconomic, and behavioral data were collected by interview and questionnaire. It was observed that the development of AGM, after adjustment for age, sex, and individual SES, people living in areas with the most disadvantage conditions were significantly more likely to develop Abnormal Glucose Metabolism leading to diabetes, compared with those living in the least deprived areas. The study concluded that characteristics of the physical, social, and economic aspects of local areas influence chronic diseases like diabetes risk (Emily et al. 2012).

Dietary intake appeared to be one of the most important risk factors influencing the disease. The author believed that the dietary assessments accurately reflected the eating habits of the subjects because of 24-hour food recall (Witschi 1988) methods on three nonconsecutive weekdays and used standard table ware items, food models and pictures of commonly eaten foods. Furthermore, diabetic subjects were unaware of their condition during their study period, so it is unlikely they intentionally modified their diets. Significantly high intake of protein and processed carbohydrates were observed in the form of meat, chicken, eggs and fish, sugar, jaggery and sweets, lots of oil, saturated fat such as ghee, and pickles. Consumption of lots of oil and *paranthas* (rotis cooked in oil or ghee) were observed among the diabetic patients with vegetables and fruit consumption comparatively

less. According to the study conducted in dietary pattern among the Vietnam people, stated that evolving dietary patterns with increasingly more protein and meat consumption were the reasons to contribute to the deterioration of glucose metabolism among the Vietnamese people leading to diabetes (Le Nguyen et al. 2005). The study also supported the fact that the people were not aware of their concept of healthy food consumption, which could be due to inheritance of unhealthy traditional dietary pattern in different ethnic groups of the studied population coexisting with low level of awareness of healthy diet. According to Emily and associates, The consumption of white rice is associated with a significantly increased risk of type 2 diabetes, especially in Asian (Chinese and Japanese) populations which indicated marked differences in the incidence of Type 2 Diabetes and its dietary habits (Emily et al. 2012). Also in a study carried out by Erber and associates, to examine the influence of three dietary patterns of "fat and meat," "vegetables," and "fruit and milk" on diabetes risk in the Hawaii component of the Multiethnic Cohort with 29,759 Caucasians, 35,244 Japanese Americans, and 10,509 Native Hawaiians, it was observed that fat and meat was significantly associated with diabetes risk in men and women, and concluded that Foods high in meat and fat appeared to confer a higher diabetes risk in all ethnic groups, whereas the effects of other dietary patterns vary by sex and ethnicity (Erber et al. 2009).

CONCLUSION

Maximum numbers of patients were Marathas, the Warrior Class followed by Brahmins, Backward Caste, Others. The diabetics though had some sort of formal education but had low awareness about the disease, ignorance about their healthy diet pattern and belonged to Class II category with mixed type of work pattern of both sedentary and non-sedentary. All these might have contributed to deterioration of glucose metabolism coupled with stress and high and resulted in high different ethnic groups of incidence of diabetes in India. Hence further studies are required to evaluate the various epidemiological and environmental factors, dietary patterns, socio-cultural and economic status, influencing incidence and distribution of diabetes in different parts of ethnic groups of India.

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NOTES

1. A caste may be defined as a collection of families or groups of families bearing a common name which usually denotes or is associated with specific occupation, claiming common descent from a mythical ancestor, human *or* divine, professing to follow the same professional callings and are regarded by those who are competent to give an opinion as forming a single homogeneous community (Risley 1891).
2. Socio-economic status (SES) is one of the most widely studied constructs in the social sciences where it is a quantification of family income, parental education, and occupational status (Robert et al. 2002).

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