

A Study on the Risk Factors in Adults Diagnosed with Multiple Sclerosis

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Abstract: Multiple Sclerosis (MS) is a chronic disorder of the central nervous system with an unclear etiology and limited research on its risk factors. This retrospective, descriptive study used purposive sampling to recruit 80 adults (55 women, 25 men), aged 18–70 years, registered with various chapters of the Multiple Sclerosis Society of India (MSSI). The study was conducted to identify the risk factors in MS. Data were collected on socio-demographic characteristics, medical history, anthropometric measurements and risk factors for MS. Most participants were between 25 and 45 years of age. The age of onset for men was predominantly 20–30 years (44%), while for women it was distributed between 20–30 years (34%) and 31–40 years (32.7%). Relapsing–remitting MS was the most common type of MS. A majority of participants, males (72%) and females (54.5%) were born in winter (August–January), highlighting birth month as a potential risk factor. Breastfeeding was reported by most males (72%) and females (65.5%), while caesarean births accounted for 52% of males and 54.5% of females. Although few reported recurrent childhood infections, varicella (chickenpox) incidence was high among females (87.2%). Before MS onset, most males (88%) and females (83.6%) did not engage in regular exercise, and stress was identified as a major trigger by 68% of males and 69% of females. Smoking before disease onset was reported by 72% of males. Vitamin D deficiency or insufficiency was common. A significant positive correlation ($p < 0.01$) was observed between pre-onset body weight (before diagnosis) and BMI as well as current body weight and BMI in both genders. This study highlights multiple modifiable and non-modifiable risk factors for MS, including winter birth, stress, low physical activity, smoking, and vitamin D deficiency in Indian MS population. These findings underscore the need for early lifestyle intervention strategies to reduce risk and help in disease management.

Keywords: Multiple Sclerosis, Risk Factors, Winter births, Vitamin D deficiency, smoking, physical inactivity, stress, Body mass index (BMI)

Introduction:

Multiple sclerosis (MS) is a condition where the body's immune system damages the protective covering (myelin) and nerve fibers in the brain and spinal cord. In the early stages, the inflammation comes and goes, and the body is able to repair some of the damage, which is why symptoms may appear during flare-ups and then improve. However, over time, the constant immune activity and ongoing damage cause the brain's support cells (microglia) to remain active, leading to long-term nerve degeneration. This gradual damage is what contributes to the progressive disability seen in MS (Compston and Coles, 2008).

The disease affects individuals between the ages of 20 and 50 years, with a peak age of 29, and females being predominantly affected than men with a ratio of 3:1 (Hunter, 2016). MS lesions develop in various areas of the brain and spinal cord which, in turn, causes a wide array of clinical manifestations. Some of the signs and symptoms of MS include vision, sensory and speech problems, tremor, spasticity, bladder and bowel problems, difficulties with respect to gait and psychological problems (Staff et al., 2009).

The etiology of MS is unknown and has been considered a complex multicausal disease. Inflammation of central nervous system, the cause for which is unknown, is the primary cause of damage in MS. Studies have suggested that genetic, environmental or infectious agents can influence the onset of MS (Loma and Heyman, 2011). Environmental factors, such as exposure to sunlight, season of birth, obesity, vitamin D deficiency, lack of physical activity, gut microbiome and smoking, are known to be risk factors for MS (Milo and Kahana, 2010). Bansil et al. (1997), looked into environmental and infectious risk factors in Indian patients and reported no difference in prior foreign travel, surgeries, blood transfusions, chicken pox, mumps infections and exposure to cats/farm animals as risk factors

MS patients have a reduced life expectancy of 7–14 years compared with the general population (Scalfari et al., 2013). Certain modifiable health factors such as smoking, alcohol overuse, physical inactivity, obesity and poor nutrition are risk factors for common co-morbidities in MS. Hypertension, Type 2 diabetes, hyperlipidemia, ischemic heart disease and chronic lung disease are also found to be co-morbidities for MS. One of the ways to address these co-morbidities is to prevent it altogether, and to help patients achieve a better quality of life through a healthy lifestyle (Marrie et al., 2016).

Need for the study

MS is commonly seen more in women than men with a ratio of 2:1, and seen between the ages of 20-40 years. MS affects the productivity of a nation and hinders the younger generation from leading a productive life and is often termed as “Crippler of the young adults.”

The unpredictable nature of MS and the eventually occurring disability requires a high level of care that often exceeds family resources and abilities. Without appropriate management of the disease, people with MS might be at a serious risk for clinical deterioration, injury, inadequate nutrition and hydration (Minden et al., 2004). The study will also help in identifying the risk factors for MS patients in India, which can be used to formulate a risk factor questionnaire that can be used in the normal population to measure the risk of MS. By identifying the risk factors, early intervention can be facilitated to prevent the onset of this debilitating disease in the younger population.

Materials and Methods

The present study was carried out to identify risk factors in male and female subjects affected with Multiple Sclerosis (MS). Subjects were included from four chapters of the Multiple Sclerosis Society of India (MSSI)-Chennai, Mumbai, Pune, Bangalore. Information pertaining to anthropometric measurements and risk factors was obtained in these subjects before and after the diagnosis of MS.

Design of the Study

The design of the study comprised of a retrospective and descriptive design.

Selection of Sample

Purposive sampling technique was used to select 80 subjects in the age group of 18-70 years registered with the MSSI. Of the 80 subjects, there were 55 women and 25 men registered with various chapters of the MSSI.

Criteria for sample selection

Inclusion criteria

1. Men and women diagnosed with multiple sclerosis, and registered with various chapters of Multiple sclerosis society of India willing to participate in the study.
2. Subjects with all types of multiple sclerosis were selected.

Exclusion criteria

1. Pregnant women were excluded from the study.
2. Subjects who were severely disabled or bed-ridden were excluded.

Institutional Ethics Committee of the Women's Christian College, Chennai, approved the protocol of the study. After obtaining the consent from all the chapters of Multiple sclerosis society of India for conducting the study, individual written informed consent was obtained from the subjects who attended the monthly meetings at Chennai chapter, while informed consent was obtained through e-mail for subjects from other chapters of India.

Tools used for the Study

Data from the following tools was obtained directly from subjects of the Chennai chapter who were able to attend the monthly meetings, whereas secondary data was used to obtain this information from subjects registered from other chapters of India.

1.Questionnaire/Interview schedule: A questionnaire was used to elicit information on age, socio-economic status, personal information, risk factors and medical history. Interview schedule was administered to subjects who attended the monthly meetings at Chennai chapter. For all other subjects, the questionnaire was sent via e-mail as Google forms.

2. Anthropometric Measurements

a) Height: Height of the subjects in Chennai chapter was recorded using a flexible non- stretchable tape. For measuring height, the subjects were requested to remove their footwear and stand with head and heel against the wall and height was recorded to the nearest 0.1 cm.

b) Body weight: Body weight of the subjects from Chennai chapter was measured using a digital weighing scale. After setting to zero, subjects were asked to remove their footwear and stand still on the measurement platform without touching anything, with the body weight equally distributed on both feet. Body weight was recorded to the nearest 0.5kg.

c) Body Mass Index (BMI): BMI of the subjects was calculated as weight in kilogram divided by height in meters square. The initial BMI (before MS diagnosis) was taken from the subject's medical records and the current BMI was calculated using the anthropometric measurements.

$$\text{BMI} = \frac{\text{Body weight (kg)}}{\text{Height (m)}^2}$$

Statistical Analysis: The "Statistical Package for Social Sciences" (SPSS) software, version 21.0, was used to analyze the data. While mean and standard deviation were utilized for continuous variables, descriptive statistics like frequency and percentage, were used for categorical variables.

Results

The present study was carried out to identify risk factors in subjects diagnosed with MS. 80 subjects comprising of 55 women and 25 men in the age group of 18-70 years registered with the Multiple Sclerosis Society of India (MSSI) were selected for the study.

Table 1 Percentage distribution of subjects according to age, state of residence, type of family and marital status

Parameter	Number of subjects (n=80)	
Age range (in years)	No.	%
18-25	10	12.5
26-35	26	32.5
36-45	24	30
46-55	17	21.3
56-65	1	1.3
66-70	2	2.5
State of residence	No.	%
Tamilnadu	45	56.3
Maharashtra	30	37.5
Karnataka	5	6.3
Type of Family	No.	%
Nuclear family	54	67.5
Joint family	24	30
Extended family	2	2.5
Marital status	No.	%
Single	28	35
Married	46	57.5
Divorced	5	6.3
Widowed	1	1.3

From Table 1, it could be inferred that most of the subjects were distributed between 25 and 45 years of age. The majority of the subjects (54%) belonged to nuclear families, while 30 per cent belonged to joint families. Most of the subjects (57.5%) were married. MS can have an impact on the relationships and can cause adjustment issues.

Table 2

Percentage distribution of subjects based on gender, age of onset, duration of the disease and type of MS

Parameter	Male subjects (n=25)		Female subjects (n=55)	
Gender	No.	%	No.	%
	25	31.2	55	68.7
Age of Onset (yrs)	No.	%	No.	%
Less than 15	0	0	2	3.6
15-20	5	20	11	20
20-30	11	44	19	34.5
31-40	7	28	18	32.7
41-50	2	8	5	9.1
Disease Duration	No.	%	No.	%

0-10 yrs	12	48	35	63.6
11-20 yrs	12	48	18	32.7
21-30 yrs	1	4	2	3.6
Type of MS	No.	%	No.	%
Relapsing-remitting MS	6	24	27	49
Secondary-progressive MS	2	8	4	7.3
Primary-progressive MS	4	16	2	3.6
Progressive-relapsing MS	0	0	4	7.3
Other forms	0	0	1	1.8
Not aware	13	52	17	30.9

From table 2, majority of the subjects in this study were females (68.75%). Most of the subjects were found to be affected with this condition after their 20's. The age of onset of MS of most of the males (44%) was 20-30 years, while for women, age of onset was equally distributed between 20-30 (34%) and 31-40 (32.7%) years. For male subjects, the duration of the disease was equally distributed between 0-10 (48%) and 11-20 yrs (48%), while the duration of the disease for most women was less than ten years (63.6%). Relapsing remitting MS and primary progressive MS were more commonly observed in them.

Table 3

Subjects	Birth Month / Season – Winter (Aug–Jan)	Birth Month / Season – Summer (Feb–Jul)	Breastfeeding (Yes)	Breastfeeding (No)	Mode of Childbirth (Vaginal)	Mode of Childbirth (Caesarean)
Male (n=25)	18 (72%)	7 (28%)	18 (72%)	7 (28%)	12 (48%)	13 (52%)
Female (n=55)	30 (54.5%)	25 (45.5%)	36 (65.5%)	19 (34.5%)	25 (45.4%)	30 (54.5%)

A majority of the subjects including males (72%) and females (54.5%) were born during the winter season in the months between August and January. Most of the male (72%) and female (65.5%) subjects were breastfed during their childhood, and breastfeeding during childhood can reduce the risk of onset of MS. Most of the male (52%) and female (54.5%) subjects were born through caesarean births.

Table 4 Percentage Distribution of Subjects According to History of Recurrent Childhood Infections and Pre-Onset Exercise Involvement in Multiple Sclerosis Patients

Subjects	Measles (No./%)	Epstein- Barr Virus (No./%)	Chicken- Pox (No./%)	Mumps (No./%)	Subjects Involved in Exercise (No./%)	Subjects Not Involved in Exercise (No./%)
Male (n=25) – Yes	7 (28)	3 (12)	5 (20)	7 (28)	3 (12)	–
Male (n=25) – No	18 (72)	22 (88)	20 (80)	18 (72)	–	22 (88)
Female (n=55) – Yes	12 (21.8)	5 (9.1)	48 (87.2)	16 (29.1)	9 (16.4)	–
Female (n=55) – No	43 (78.2)	50 (90.9)	7 (12.7)	39 (70.9)	–	46 (83.6)

A majority of subjects did not have a history of recurrent infections in their childhood but the incidence of chicken pox (Varicella zoster virus) was high among females (87.2%). A few subjects were found to exercise before the onset of MS. A majority of the male (88%) and female (83.6%) subjects were not involved in regular exercise before their onset of MS. Exercise is known to reduce the risk of MS and is considered a protective factor.

Table 5 Correlation between pre-onset body weight and BMI, and current Body weight with current BMI of male and female subjects

Subjects	Variable		'r' value	'p' value
	Pre-onset body weight (kg) (Mean ± S.D)	Initial BMI(kg/m ²) (Mean ± S.D)		
Male (n=25)	75.9±11.3	27.42± 3.9	0.88	0.000**
Female (n= 55)	63.09±15.3	25.2± 5.6	0.90	0.000**
Subjects	Current body weight (kg) (Mean ± S.D)	Current BMI(kg/m ²) (Mean ± S.D)	'r' value	'p' value
Male (n=25)	79.6±13.2	28.29±4.7	0.94	0.000**
Female (n= 55)	64.15±16.2	25.79± 6.5	0.89	0.000**

**p<0.01

A significant positive correlation ($p < 0.01$) was observed between pre-onset body weight (before diagnosis) and BMI as well as current body weight and BMI in both genders.

Table 6
Percentage distribution of subjects based on their Vitamin D levels

Vitamin D levels	Vit D status	Male subjects (n=24)		Female subjects (n=42)	
		No.	%	No.	%
< 12 ng/ml	Severe Deficiency	2	8	2	3.6
< 20 ng/ml	Deficiency	6	24	11	20
21-29 ng/ml	Insufficient	8	32	19	34.5
≥30 ng/ml	Adequate	8	32	10	18.1

A majority of the subjects had deficiency or insufficient levels of Vitamin D. It could also be related to many of the subjects not being exposed to sunlight before MS onset as observed in table 6. Vitamin D plays an important role in MS and according to research studies, it is also one of the risk factors in Multiple Sclerosis.

Discussion

According to studies, MS typically affects adults in the age range of 20 to 45, and is termed as the "Crippler of the young Adults"(Goldenberg, 2012). Type of family plays an important role in the course of the disease, as family can be a source of support in terms of social, moral, financial and overall wellbeing. When more members are present in the family, looking after patients can be an easier task. However, MS in a family member can also create psychological stress among other members as well as on functioning within families. Common problems include the impact of the emotional state of the person with MS on family members, the effect of lack of information on MS, communication within the family and with healthcare professionals, and the need to consider families in planning intervention programs (Uccelli, 2014).

Studies have shown that MS can affect marital relationships and increase the likelihood of divorce. According to a study conducted in 2010, an increased probability of divorce was observed if the couple were childless, and also when one partner contracted a chronic disease before 36 years of age (Pfleger et al., 2010).

According to a study, when the disease occurs at a later stage, the disability progression tends to be faster and subjects can rapidly enter the progressive phase of the disease (Cierny et al., 2017). Intervention during the relapsing remitting phase can help delay the onset of disability and conversion to other progressive forms.

In the Indian population, there are no studies to understand risk factors in the etiology of MS. Therefore, based on the limited studies conducted in the MS population, a few factors were considered to understand their role as a risk factor for MS. Birth month has been elucidated as one of the risk factors in MS due to low exposure to sunlight, maternal vitamin D levels and seasonal variability. A similar trend has been observed in this study. According to a study conducted in Australia, there was a risk of MS with month of birth for those born in November-December compared with those born in May-June (Staples et al., 2010). According to a study, the absence of infant breastfeeding was associated with an increased risk of pediatric-onset of MS (Brenton et al., 2017). According to one study, subjects who were born by cesarean had a higher risk of developing MS (Maghzi et al., 2012). Studies suggest an infectious agent acquired prior to age 14 plays a role in the risk of subsequent MS

and patients with MS reported history of varicella zoster virus at an earlier age more often than a group of non-MS patients (Ross, 1998).

Vitamin D plays an important role in MS. Studies done in healthy individuals to predict future MS risk found that elevated levels of 25(OH)D (above 75 or 100 nmol/L) among healthy young adults were associated with a 60% decreased risk of later developing MS (Munger et al., 2016).

Conclusion

With regard to identification of risk factors, the study has given new insights into the etiology of MS, by identifying the probable risk factors in the Indian MS population. There was a need for this information as there were no studies or few studies on MS in India. Although MS is a neuro-degenerative condition without any known cause, a few studies conducted in other countries have implicated environmental factors such as sedentary lifestyles, higher intake of saturated fat, and stress to be risk factors. Trying to find similarities, probable risk factors identified in this study which could apply to the Indian MS population were gender, birth month and season of birth, caesarian births, history of chicken pox, lack of exercise, poor exposure to sunlight, higher BMI and insufficient serum vitamin D status.

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