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GENDER DIFFERENCES IN CHILDREN DIAGNOSED WITH CHILDHOOD AUTISM.

Medicine

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ABSTRACT

Autism has been reported to be more common in males with M:F ratio of 4:1. This reported sex/gender bias in prevalence has its impact both in research and clinical practice - from diagnosis to its therapeutic aspects. This study has explored the gender differences in children diagnosed with Childhood Autism with respect to clinical characteristics, severity, adaptive functioning and minor physical anomalies. Sample consists of 47 children (34 males and 13 female children) who attended Psychiatry Department, Government Rajaji Hospital, Madurai, a tertiary care centre for the period of 8 months. Socio demographic data sheet, Kuppusamy socio economic status scale, CARS, MPA scale and VSMS were used. Statistical analysis was done by using SPSS version 14. The results indicates that, when compared with males, females have higher severity of Autism, poor verbal communication, more antenatal (AN) and peri-natal risk factors, less restricted and repetitive behaviour, presence of positive family history of Autism, poor adaptive functioning, higher number of Minor Physical Anomalies and fewer Restricted and Repetitive behaviour. Understanding these gender differences, females with autism would be better recognised in future.

KEYWORDS

Autism, Gender Differences , adaptive functioning, Minor Physical Anomalies, Antenal (AN) and Peri-natal risk factors.

INTRODUCTION

Childhood Autism belongs to the group of Pervasive Developmental Disorders, which are neurodevelopmental syndromes characterised by impairment in reciprocal social interaction, impairment in communication, restricted repetitive and stereotyped patterns of behaviour, interests and activities (Sadock BJ., and Sadock V.A., 2015). Autism has been reported to be more common in males with M:F ratio of 4:1. Studies from clinical samples report higher M:F ratio(4–6 to 1) while lower ratios (2–3 to 1) are reported in community samples (Fombonne et al 2005). This reported sex/gender bias in prevalence has its impact both in research and clinical practice - from diagnosis to its therapeutic aspects. Making this area of research still more complex, there is currently male biased nosological system and diagnostic instruments which makes autism to be under recognised in females (Lai MC et al., 2015).

There are several questions that arise when we explore into this theme of gender differences and autism - "Do females with autism have different behavioural characteristics from males with autism?" or "Why are there more males diagnosed with autism?". Many researches have been carried out to analyse all these and further how this male bias relates to the etiologies of and liability to develop autism have also been widely explored(Lai MC et al., 2015). The present study has been framed to explore the gender differences in children diagnosed with Childhood Autism. The focus is specifically laid on studying the gender differences with respect to clinical characteristics, severity, adaptive functioning and minor physical anomalies. Antenatal (AN) and Peri-natal risk factors are identified in these children and analysis of these factors is done to identify which of these would influence the severity of autism. Thus, by understanding these gender differences, females with autism would be better recognised in future and hence this would pave for early intervention in them and thereby ultimately bringing improvement in their quality of life.

AIM OF THE STUDY

To study the gender differences in children diagnosed with Childhood Autism.

OBJECTIVES

1. To study the gender differences in Autism children with regards to socio-demographic profile, age at diagnosis and perinatal risk factors in children diagnosed with Childhood Autism.
2. To study the gender differences in them with regard to age at diagnosis, perinatal risk factors, minor physical anomalies and severity of autism.
3. To study the gender differences in these children with respect to their adaptive functioning.

METHODOLOGY

Consecutive children who were between 2-8 years of age attending Psychiatry OP, Government Rajaji Hospital, Madurai, a tertiary care centre, were assessed and evaluated for Autism. In the study period of 8 months, 55 children met the inclusion criteria of Childhood Autism ICD-10 RDC (F 84.0). They were referred from Paediatrics, ENT department and Speech Therapy Unit. Parents of 8 children didn't consent for the study due to constraint of time. Children who had co-morbid neurological illness, other Pervasive Developmental Disorders, visual or hearing impairment were excluded. Hence, the study was conducted in a sample of 47 children- which comprises of 34 males and 13 female children. The study was approved by institutional ethical committee, Government Rajaji Hospital. Statistical analysis was done using SPSS (Statistical Package for Social Studies) version 14.0.

TOOLS USED

1. SEMI STRUCTURED PROFORMA

Semi-structure proforma includes demographic details, name of the referral department, reasons for referral, age at 1st consultation, age at diagnosis of Autism, AN and peri-natal risk factors , developmental milestones, family history, clinical characteristics , physical and neurological examination details.

2. KUPPUSAMY SOCIO ECONOMIC STATUS SCALE

Originally proposed in 1976. The scale was revised in 2012 and the monthly family income was modified based on current consumer price index. (BP Ravi Kumar et al, 2012). Based on the scale, socio-economic status is classified as Upper, Upper middle, Lower middle, Upper lower and Lower.

3. CHILDHOOD AUTISM RATING SCALE

This scale is designed to diagnose autism as well as to assess the severity. CARS was developed by Eric Schopler, Robert J Reichier and Barbara Rochen Renner. CARS is also useful in differentiating autism from other neurodevelopmental disorders including Intellectual Disability. 15 domains are utilized in CARS for the assessment of severity. Total CARS score ranges from 15-60 with the minimum score of 30 is necessary to diagnose autism. Based on the total score, severity is categorised as mild, moderate and severely autistic. Internal Consistency of CARS is high, with co-efficient alpha of .94 and inter-rater reliability is also high.

4. VINELAND SOCIAL MATURITY SCALE – INDIAN ADAPTATION

VSMS was originally devised by E.A.Doll in in 1935. This scale is useful in measuring the social maturity of children and young adults. Indian Adaptation of Vineland Social Maturity Scale (VSMS) was done by Dr.A.J.Malin while he was working at Nagpur Child Guidance Centre. It provides a measure of Social Age and Social Quotient., and through this social deficits as well assets can be evaluated. This scale uses following 8 domains for assessment- Self help general, Self help eating, Self help dressing, Self direction, Occupation, Communication, Locomotion and Socialization. The test is administered in a semi-structural informal atmosphere by having the mother along with the child or having the child alone depending upon the demands made by the items. S.Q= Social Age/Actual Age * 100. Recent studies have shown a consistent and higher co-variation between VSMS Social Age (S.A) and the Stanford Binet Mental Age(M.A) and the correlation is about 0.96 . This is a clear reflection of how social development and mental development are highly correlated.

5. MINOR PHYSICAL ANOMALIES SCALE

Waldrop Physical Anomaly Scale was designed by Waldrop and Halverson in the year 1971. It is widely used for the assessment of minor physical anomalies in an individual. It consists of six subscales that reflect anatomic body areas: head, eyes, ears, mouth, hands and feet. Total score ranges from 0-24.

RESULTS

In the present study subjects majority (36.1%) of the children belong to the age group of 3-4 years. About 34% of children belong to 2-3 years of age and 17% belong to 4-5 years. Rest (12.8%) of the children belong to 5-7 years of age. Male children constitute about 72.3% of the study population while female children constitute about 27.6% of the total. Around 53.2% of children belong to Upper Lower socio-economic status, 40.4% belong to Lower Middle class and the rest 6.4% belong to Upper Middle class. Majority (89.4%) belong to nuclear type of family and the status of the family was intact in 91% of children and was broken in 8% of children.

Majority of the male (82.4%) and female children (100%) were referred to Psychiatry Department from Paediatrics OP and 6% of male children were referred from ENT and Speech therapy unit. Following were the reasons for referral in male children- Language delay in 38.2%of children, for IQ assessment in 23.5%, Not turning when called in 14.7% of children, hyperactivity in 17.6% and repetitive behaviour in 5.9% of children. Main reasons for referral among female children were Language delay in 53.8% and for IQ assessment in the rest (46.2%). There is no statistically significant difference in these variables among males and females.

TABLE 1: THE COMPARISON OF VARIABLLES AMONG MALE AND FEMALE CHILDREN

S.NO	VARIABLES	MALES (N=34)		FEMALES (N=13)		CHI-SQUARE
		N	%	n	%	
1	BIRTH ORDER First Second	 27 7	 79.4 20.6	 9 4	 69.2 30.8	.544
2	AN RISK FACTORS Present Absent	 7 27	 20.6 79.4	 6 7	 46.2 53.8	3.072*
3	PERINATAL FACTORS DELIVERY Pre-term Term Post-term	 4 28 2	 11.8 82.4 5.9	 2 10 1	 15.4 76.9 7.7	1.179
4	MODEOF DELIVERY Vaginal LSCS	 24 10	 70.6 29.4	 8 5	 61.5 38.5	.354
5	BIRTH WEIGHT Low Appropriate	 5 29	 14.7 85.3	 3 10	 23.1 76.9	.467
6	BIRTH ASPHYXIA Present Absent	 4 30	 11.8 88.2	 5 8	 38.5 61.5	4.329*
7	DEVELOPMENTAL REGRESSION Present Absent	 0 34	 0 100	 4 9	 30.8 69.2	11.435**
8	POSITIVE FAMILY HISTORY Present Absent	 1 33	 2.9 97.1	 3 10	 23.1 76.9	4.897*

*=P<0.05, ** = P<0.01

From the above table it is inferred that, AN risk factors were identified in mothers of 20.6% of male children while in females it was present in about 46.2%. Regressions of previously attained milestones were identified in 30.8% of female children while this was not identified in any of the male children. Positive family history of MR/Autism was present in 23% of female children and 3% of male children. There was statistically significant difference among males and females with respect to AN risk factors, Birth asphyxia, Developmental regression and positive family history with females scoring higher in these variables.

TABLE 2: AN RISK FACTORS IDENTIFIED IN MOTHERS OF MALE AND FEMALE CHILDREN WITH CHILDHOOD AUTISM

S.NO	VARIABLES	MALES (N=34)		FEMALES (N=13)		CHI-SQUARE
		n	%	n	%	
1	NAUSEA AND VOMITTING Present Absent	 2 32	 5.9 94.1	 1 12	 7.7 92.3	.052
2	HYPERTENSION Present Absent	 3 31	 8.8 91.2	 1 12	 7.7 92.3	.015
3	GESTATIONAL DIABETES MELLITUS Present Absent	 1 33	 2.9 97.1	 1 12	 7.7 92.3	.521
4	ANTEPARTUM HAEMORRHAGE Present Absent	 1 33	 2.9 97.1	 2 11	 15.4 84.6	2.43
5	DRUG INTAKE Present Absent	 0 34	 0 100	 1 12	 7.7 92.3	2.67

From the above table it is inferred that AN risk factors identified in mothers of male children were Nausea and vomiting (6%), Hypertension (9%), Gestational Diabetes Mellitus (3%), Antepartum haemorrhage(3%). In mothers of female children, risk factors were Nausea and vomiting (8%), Hypertension (8%), Gestational Diabetes Mellitus (8%), Antepartum haemorrhage (15%) and drug intake in 8%. Significant difference was not obtained among males and females with respect to each of these Antenatal risk factors.

TABLE 3: THE COMPARISON OF VARIOUS DOMAINS OF DIAGNOSTIC CRITERIA OF AUTISM AMONG MALE AND FEMALES

S. NO	DOMAINS		MALES (N=34)		FEMALES (N=13)		CHI-SQUARE
			N	%	N	%	
1	SOCIAL INTERA-CTION	CRITERIA-A- Impairment of non-verbal behaviour. Present Absent	 31 3	 91.2 8.8	 13 0	 100 0	1.225
		Failure to develop peer relationship Present Absent	 32 2	 94.1 5.9	 11 2	 84.6 15.4	1.091

		Lack of spontaneous sharing Present Absent	 23 11	 67.6 32.4	 13 0	 100 0	5.491**
		Lack of reciprocity Present Absent	 34 0	 100 0	 13 0	 100 0	0
2	COMMUNICATION	Language development delay Present Absent	 32 2	 94.1 5.9	 13 0	 100 0	.799
		Impairment in initiation of conversation Present Absent	 1 33	 2.9 97.1	 0 13	 0 100	.391
		Stereotyped use of language Present Absent	 5 29	 14.7 85.3	 2 11	 15.4 84.6	.003
		Lack of imitative play Present Absent	 23 11	 67.6 32.4	 13 0	 100 0	5.491**
3	RESTRICTED, REPETITIVE BEHAVIOUR	Stereotyped interests Present Absent	 14 20	 41.2 58.8	 7 6	 53.8 46.2	.611
		Inflexible adherence to routine Present Absent	 1 33	 2.9 97.1	 2 11	 15.4 84.6	2.437
		Stereotyped motor mannerisms Present Absent	 24 10	 70.6 29.4	 4 9	 30.8 69.2	6.191**
		Preoccupation with parts of object Present Absent	 12 22	 35.3 64.7	 7 6	 53.8 46.2	1.344

*=P<0.05, ** = P<0.01

There was statistically significant difference with female children scoring more with respect to Lack of spontaneous sharing in "Impairment of Social Interaction" domain, Lack of imitative play in "Impairment in Communication" domain and Stereotyped and Repetitive motor mannerism in "Restricted, repetitive patterns of behaviour, interest and activities" domain. Other areas in the sub domains were lacking any statistically significant difference among the male and female children in scoring.

TABLE 4: THE COMPARISON OF MALE AND FEMALE CHILDREN WITH RESPECT TO CARS SCORE AND SOCIAL QUOTIENT IN VSMS]

S.NO	VARIABLES	MALES (N=34)		FEMALES (N=13)		CHI-SQUARE
		N	%	N	%	
1	CARS Mild-Moderate Severe	 25 9	 73.5 26.5	 2 11	 15.4 84.6	13.006** df=1
2	VSMS Moderate Mild Borderline Normal	 1 20 10 3	 2.9 58.8 29.4 8.8	 5 8 0 0	 38.5 61.5 0 0	14.274** df= 3

*=P<0.05, ** = P<0.01

From the above table it is inferred that , 73.5% of male children and 15.4% of female children were in Mild-Moderate severity category in CARS and 26.5% of males and 84.6% of females fell in Severe category and this difference among males and females is statistically significant.

Further, in VSMS measuring the Social Quotient., among males- 58.8% were in mild category, 29.4% were in borderline, 2.9% were in moderate and 8.8% had social quotient within normal range. Among females- 61.5% were in mild category and 38.5% fell in moderate category and this difference is statistically significant.

TABLE 5: TABLE SHOWING THE COMPARISON OF VARIABLES AMONG MALE AND FEMALE CHILDREN

S.NO	VARIABLES	GENDER	N	MEAN	S.D	t-test
1	AGE	MALE	34	3.83	1.277	-.240
		FEMALE	13	3.92	.856	
2	AGE AT FIRST CONSULTATION	MALE	34	2.44	.389	.566
		FEMALE	13	2.36	.463	
3	AGE AT FIRST DIAGNOSIS	MALE	34	3.20	.445	1.110
		FEMALE	13	3.03	.477	
4	PATERNAL AGE	MALE	34	30.24	3.610	-.846
		FEMAE	13	31.46	6.186	
5	MATERNAL AGE	MALE	34	26.68	3.804	-.995
		FEMALE	13	28.15	6.162	
6	CARS- TOTAL	MALE	34	35.47	3.661	-4.764**
		FEMALE	13	41.23	3.833	
7	VSMS- SOCIAL QUOTIENT	MALE	34	65.73	12.437	3.859**
		FEMALE	13	51.38	7.890	
8	MPA- SCORE	MALE	34	1.5	1.283	-5.523**
		FEMALE	13	3.69	.854	

*=P<0.05, ** = P<0.01

From the above table, Mean total score in CARS in males was about 35.47 and females it was 41.23. Mean of Social Quotient score in VSMS was about 65.7 in males and 51 in females. Mean score in MPA was about 1.5 in males and 3.7 in females. This difference in CARS, VSMS and MPA score are statistically significant with females scoring higher.

TABLE 6: THE COMPARISON OF VARIOUS SUB-DOMAINS IN CARS AMONG MALE AND FEMALE CHILDREN

S.NO	SUB-DOMAINS	GENDER	N	MEAN	S.D	t-test
1	RELATING TO PEOPLE	MALE	34	2.58	.358	5.37**
		FEMALE	13	3.23	.388	
2	IMITATION	MALE	34	2.29	.478	-1.44
		FEMALE	13	2.50	.288	
3	EMOTIONAL RESPONSE	MALE	34	2.48	.484	-5.37**
		FEMALE	13	3.30	.434	
4	BODY USE	MALE	34	2.51	.583	2.06*
		FEMALE	13	2.15	.375	
5	OBJECT USE	MALE	34	2.51	.596	-.796
		FEMALE	13	2.65	.315	
6	ADAPTATION TO CHANGE	MALE	34	1.79	.739	-1.21
		FEMALE	13	2.07	.640	
7	VISUAL RESPONSE	MALE	34	2.44	.422	-2.02*
		FEMALE	13	2.73	.483	

8	LISTENING RESPONSE	MALE	34	2.66	.648	-2.52**
		FEMALE	13	3.15	.427	
9	TASTE,SMELL AND TOUCH RESPONSE	MALE	34	2.22	.525	-1.08
		FEMALE	13	2.38	.219	
10	FEAR/ NERVOUSNESS	MALE	34	1.66	.725	-3.50**
		FEMALE	13	2.46	.627	
11	VERBAL COMMUNICATION	MALE	34	2.67	.474	-3.65**
		FEMALE	13	3.23	.438	
12	NON-VERBAL COMMUNICATION	MALE	34	2.57	.524	-2.37
		FEMALE	13	2.96	.431	
13	ACTIVITY LEVEL	MALE	34	2.25	.630	-1.04
		FEMALE	13	2.26	.330	
14	INTELLUCTUAL RESPONSE	MALE	34	2.33	.532	-2.22*
		FEMALE	13	2.73	.563	
15	GENERAL IMPRESSIONS	MALE	34	2.48	.468	-5.27**
		FEMALE	13	3.38	.650	

*=P<0.05, ** = P<0.01

On applying Student t test for the data, statistically significant difference among males and females is obtained with following sub-domains in CARS – Relating to people, emotional response, body use, visual response, listening response, fear/nervousness, verbal communication, intellectual response and general impressions with females scoring higher in all these sub-domains except for body use in which males score higher.

TABLE 7: THE COMPARISON OF VARIOUS SUB-DOMAINS IN MINOR PHYSICAL ANOMALIES SCALE AMONG MALE AND FEMALE CHILDREN

S.NO	SUB-DOMAINS	GENDER	N	MEAN	S.D	t-test
1	HEAD	MALE	34	.47	.563	-6.053**
		FEMALE	13	1.69	.751	
2	EYES	MALE	34	0	0	0
		FEMALE	13	0	0	
3	EARS	MALE	34	.61	.652	-2.367*
		FEMALE	13	1.15	.800	
4	MOUTH	MALE	34	.029	.171	-3.633**
		FEMALE	13	.384	.506	
5	HANDS	MALE	34	0	0	0
		FEMALE	13	0	0	
6	FEET	MALE	34	.441	.560	-.114
		FEMALE	13	.461	.518	

*=P<0.05, ** = P<0.01

From the above table it is inferred that there is statistically significant difference among males and females with respect to following sub-domains in MPA scale- Head, Ears and Mouth with females scoring higher in all these. Neither of them had scored in Eyes and Hands sub-domain. There is no difference among them with respect to Feet sub-domain.

DISCUSSION

The present study discussing the obtained results under the following headings, gender difference with respect to clinical characteristics, severity of the Autism symptoms, environmental risk factors, adaptive functioning and minor physical anomalies..

GENDER DIFFERENCES

The present study, M: F ratio is 3:1 (Males N= 34 and Females N=13). This gender ratio points towards male preponderance of autism in our study. Though, the most widely reported M: F prevalence ratio for Autism is 4-5:1 (Fommbonne et al 2011)., recent large scale epidemiological studies report that M:F ratio is lower in the range of 2-5: 1 (Idring et al 2012 ; Mattila et al 2011 ; Baren Cohen et al 2009). It could be understood by the increased recognition of females with autism in high functioning end in recent years (Rutter et al 2003).

GENDER DIFFERENCES WITH RESPECT TO CLINICAL CHARACTERISTICS

There is statistically significant difference among male and female children with respect to Lack of spontaneous sharing in "Impairment of Social Interaction" domain, and Lack of imitative play in "Impairment in Communication" domain –with females scoring higher in these domains. Males score higher in Stereotyped and Repetitive motor mannerism in "Restricted, repetitive patterns of behaviour, interest and activities" domain. There is a significant difference among males and females is obtained with following sub-domains in CARS – Relating to people, emotional response, visual response, listening response, fear/nervousness, verbal communication, intellectual response and general impressions with females scoring higher in all these sub-domains and males score higher in body use sub-domain.

All these above study findings could be understood by the increased severity of autism in females. In other words, significant impairment in multiple domains exists on comparison with males and this would further contribute for the severity of autism among females. Further, females have poor verbal communication but have less restricted repetitive behaviour. Males commonly have "Restricted, repetitive patterns of behaviour, interest and activities" (RBBI). In contrast with our study findings of females having poor verbal communication - most studies support the view that social-communication difficulties in females is comparable with males but they have less RBBI (Von Wijngaarden Cremers et al 2014; Frazier et al 2014; Szatmari P et al 2012). This difference in clinical characteristics among females in our study population may be due to under representation of females at higher functioning end and the clinical characteristics of females at lower functioning end (Severe autism) are only reflected in our study. Hence, this might be the reason for the presence of poor verbal communication among females in our study.

GENDER DIFFERENCES -WITH RESPECT TO SEVERITY OF THE SYMPTOMS

In the present study more females have fall under the severe category of Autism whereas males were represented in Mild to Moderate category of Autism. If it is taken as under-representation of mild-moderate autism in females, it can be considered that male gender bias in diagnostic instruments led to under-recognition of females in mild-moderate category and hence females at high functioning end could not be identified. This finding of autism being severe in females is supported by many previous International studies (Frazier et al 2014) and an Indian study (Malhotra et al 2003). Autism is of higher severity in females due to the following facts- Females have greater etiological and genetic load i.e., more genetic mechanisms operate in them so that they develop autism. This greater genetic load together acted upon with environmental risk factors duplicates the severity of autism in them. This is a very significant finding in our study that severity of autism is undoubtedly proven in these children. Presence of positive family history supports the fact of greater genetic load in females as replicated in previous studies (Sander et al 2011).

GENDER DIFFERENCES -WITH RESPECT TO ENVIRONMENTAL RISK FACTORS

In the present study, on the whole AN risk factors are more in females when compared with males but risk factors individually did not have any qualitative differences. AN risk factors that were identified among females are Nausea and vomiting, Hypertension, Gestational Diabetes, Antepartum Haemorrhage and drug intake during pregnancy. Though, qualitative difference in risk factors is not identified among males and females, there exists quantitative difference in presence of AN risk factors with females having higher prevalence of these risk factors. This quantitative difference in presence of AN risk factors is supported by previous studies (Larsson et al 2005; Sato et al 2012).

Role of environmental factors in the aetiology of Autism is supported by the fact that concordance rate of Autism is never 100% and it is only 70%. AN risk factors that are identified in our study are well established risk factors for development of autism as supported by previous studies and meta-analysis (Hannah Gardener and Donna Spiegelman et al 2009). This could also be understood in other ways that females in our study sample not only had increased genetic load (as evidenced by positive family history) but also had environmental risks (AN risk factors) which could have contributed for increased severity of autism in them. Female children in our study also have increased prevalence of peri-natal risk factors (birth asphyxia) when compared with male children. It has been hypothesized that peri-natal conditions that precipitate hypoxia in the neonate increases the risk for major neuropsychological and neuropsychiatric disturbances (Robertson CM et al 1993) and also increases the risk for Autism. According to Bolton PF and Murphy 1997, there is a common genetic

vulnerability to autism and adverse pregnancy outcome. Hence children with autism also have genetic predisposition for the presence of adverse pregnancy outcome and this might also be the reason for the prevalence of peri-natal risk factors in these children.

GENDER DIFFERENCES -WITH RESPECT TO ADAPTIVE FUNCTIONING

The present study found that, females showing poorer adaptive functioning and also it is related with increased severity of Autism in them. This may be due to the increased severity of autism in females would itself interfere with an individual's ability to learn adaptive skills. This finding is supported by previous Study (Frazier et al 2014).

GENDER DIFFERENCES -WITH RESPECT TO MINOR PHYSICALANOMALIES

The present study findings of higher number of MPAs (Head, Ears and mouth sub domains) in females could also be understood by the fact that MPAs are also related to adverse prenatal/perinatal environment. As the prenatal risk factors increase the vulnerability of developing brain to Autism, it also modifies/deviates the development of facial and limbic structures. Thus children with increased prenatal and perinatal risk factors have higher rates of MPAs (J S Tay et al 1979). In support of this, females in our study population who have increased pre and peri-natal risk factors also have higher number of minor physical anomalies when compared with males.

LIMITATIONS OF THE STUDY

This result would have been better if there were a larger sample size. Standardized diagnostic instruments for Autism was not used and formal IQ testing for children was not done in our study. Analysis of ANand peri-natal risk factors in these children would have been better if the prevalence of these was compared with general population which was not possible in our current study design. Study being done at Government Hospital settings which caters middle and low socio-economic class, these findings could not be extrapolated to general population.

CONCLUSION

The present research concluded that, when compared with males, females have higher severity of Autism, poor verbal communication, more AN and peri-natal risk factors, less restricted and repetitive behaviour, presence of positive family history of Autism, poor adaptive functioning, higher number of Minor Physical Anomalies and fewer Restricted and Repetitive behaviour. There were no gender differences with respect to age at diagnosis of Autism.

FUTURE DIRECTIONS

Many studies identifying gender differences in Autism is crucial for not mere understanding the behavioural phenotypes, but for better knowledge into neurobiology and genetics of Autism. In order to explore this, large scale population based epidemiological research should be carried to identify the pre and perinatal factors involved in autism and more studies with male/female-balanced design are essential. Further, population based genetic studies are needed to further test the multi-factorial multi-threshold and genetic variability models. Thus, by understanding these gender differences, females with autism would be better recognised in future and this exploration of research would also be further extended into the management aspects in forthcoming years.

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