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Clinical, Biochemical and Radiological Profile of Wilson's Disease from a Tertiary Care Referral Centre in India

Niraj Kumar[1], Deepika Joshi[2], Abu Zafar Ansari[2], Surya Prakash Patidar[2], Vijay Nath Mishra[1], Rameshwar Nath Chaurasia[2]

1 Department of Neurology IGIMS Patna, India
2 Department of Neurology , IMS, BHU Varanasi, India

Corresponding Author: Deepika Joshi

Department of Neurology, IMS, BHU, Varanasi, India

drdeepikajoshi73@gmail.com

Tel: 9918978666

Abstract

Background: Wilson's disease is the commonest treatable movement disorder in young adults. The disease has protean manifestations & patient may first present to a psychiatrist, neurologist, hepatologist, nephrologist, gastroenterologist or rheumatologist. A high index of suspicion is required for an early diagnosis and proper management to prevent the disabling sequalae.

Aims & objectives: The current study aimed to evaluate the clinical, biochemical, neuroimaging, and therapeutic aspects of Wilsons Disease patients coming to neurology outpatient department and wards of a tertiary care university hospital primarily caring for patients coming from Eastern part of India during the period from November 2007 to August 2009.

Material & methods: The present study was carried out on 31 patients of Wilson's disease. All the patients fulfilling the inclusion criteria were subjected to a detailed clinical history, physical and neurological examination as per the standard protocol prepared by us after an informed consent. Biochemical parameters (serum copper, ceruloplasmin and 24 hours urinary copper), Neuroimaging and electroencephalography were performed in all patients.

Results: The mean age of onset was 12.41 ± 4.41 years (range7 to 21.5 years), the mean delay indiagnosis was 16.96 ± 10.716 months (range 4.92 to 42 months) and the mean age at diagnosis was 13.83 ± 4.69 years (range 7.5 to 23 years) 24 (77.4%) patients were juveniles (age below 18 years) and 7(22.6%) were adults (age more than 18 years) Dystonia was the commonest initial neurologic feature and was seen in 20(64.5%) patients and was followed by dysarthria (41.9%), drooling of saliva (38.7%), parkinsonian features (38.7%), abnormal gait (25.8%), abnormal behaviour (22.6%), tremors (16.1%) and declining school performance (9.7%) Among the main neurological features, the dystonic group predominated with (83.9%) patients, followed by the parkinsonian group (64.5%), cerebellar group (22.6%) and the choreoathetoid group (9.7%). Dystonia and parkinsonian features were the commonest clinical presentations in juvenile patients, while the elderly group of patient showed predominantly cerebellar features.

Conclusion: Early and correct diagnosis and institution of proper treatment with lifelong continuation can prevent devastating consequences as the disease is treatable. Screening of all asymptomatic siblings for Wilson disease is an important issue and must be carried out in all.

Keywords: Wilson's disease clinical profile, Wilson's disease and copper studies, Wilson's disease and neuroimaging

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Introduction

Wilson's disease (WD), an autosomal recessive disease caused by mutations in the ATP7B gene has protean manifestations and the patient may first present to a psychiatrist, neurologist, hepatologist, nephrologist, gastroenterologist or rheumatologist [1]. The ATP7B gene makes a protein important for copper transport and the elimination of excess copper from the body. The mutated gene prevents the transport protein from functioning properly, allowing copper to accumulate in the liver, brain, kidneys and skeletal system [2,3] and the disease presents with features that mainly suggest involvement of the liver and the brain. It most commonly affects children or young adults and runs an invariably fatal course if not adequately treated by decoppering therapy [4]. In fact, WD is the commonest treatable movement disorder affecting young persons. Our understanding of the disease has progressed from the clinical description to biochemical and histological aspects and finally to the genetic basis of copper metabolism [5]. Increased awareness, improved diagnostic facilities leading to earlier recognition even in the presymptomatic phase, clear distinction from mimicking conditions, aggressive therapeutic approaches owing to effective treatment, and an overall reduction in the morbidity and mortality are some of the expected changes over a century [6]. There is no consensus regarding therapeutic protocols, and use of penicillamine, once a gold standard for treatment, has been reported to be counterproductive [7]. Mortality and morbidity of this potentially treatable disease are still a cause of concern.

Material and Method

The current study describes the clinical, biochemical, neuroimaging, and therapeutic aspects of WD patients coming to neurology OPD and wards of a tertiary care university hospital primarily caring for patients coming from Eastern part of India. This study was carried out on 31 patients of Wilson's disease attending the Neurology OPD or getting admitted as in-patient in Neurology Ward of a tertiary care referral hospital in India from november 2007 to august 2009. A valid informed consent was taken from all the patients. The institute's ethical committee approved the study. All the patients were subjected to a detailed clinical history, physical and neurological examination as per the standard protocol prepared by us. The past history of hepatic or psychiatric illness and family history of similar illness was taken from all patients. An ophthalmological examination for the presence of Kayser-Fleischer ring was carried out by examination with naked eye and by slit lamp evaluation. The patients were subjected to routine blood counts, liver function tests and estimations of total serum copper, serum ceruloplasmin and 24 hours urinary copper excretion. Neuroimaging was done in all cases. 4 patients underwent CT scan brain and 27 patients underwent MRI brain. EEG was performed in six cases that had manifestations of seizures.

Inclusion criteria

The diagnosis was based on the following [4,5,8]

1. History and clinical features suggestive of Wilson's disease.

2. Presence of Kayser-Fleischer ring by slit-lamp examination.

3. Increased 24-hour urinary copper excretion (>100 µg/24 hours)

4. Decreased serum ceruloplasmin level (<20 mg/dl)

5. Decreased serum copper level (<75 µg/dl)

Patients fulfilling the criteria 1-3 plus one or more criteria out of 4 and 5 were included in the study.

Copper studies

Serum ceruloplasmin: By nephelometry method (Normal value=20-60 mg/dl)

24-hour urinary copper: By atomic absorption spectrometry (graphite furnace) with Zeeman correction (Normal value=2-30 µg/ L)

Serum copper: By spectrophotometry; Normal value=70-150 µg/ dL (in males); 80-155 µg/dL (in females).

Neuroimaging: CT scan brain was done on Light Speed Volume Computer Tomography version machine of 64 slice MSCT (Multi Slice Computer Tomography). Magnetic resonance imaging (MRI) of brain was done by MRI machine (ESSANZA version of SIEMENS) of 1.5 tesla strength. T1, T2 weighted images and FLAIR sequences with saggital, axial and coronal cuts were taken.

Electroencephalography (EEG): Sixteen channels EEG recording was done on grass-telefactor twin recording and analysis software system as per international guidelines.

Statistical analysis: Data were entered into Microsoft excel and SPSS version 16 was used for analysis. Data have been presented in the form of numbers and percentages. The mean and standard deviation was calculated wherever required. Chi square test or Fisher's exact probability test was used to find out the significant difference between the proportions according to the suitability of the data. Student t-test was applied to find out the significant difference between the mean levels. Mann-Whitney U test was also used to find out the significant difference between the means when the data are non-normal. P value is taken as 5% at two sided test.

Results

The present study comprised 31 patients of Wilson's disease(WD). Each case was thoroughly evaluated as mentioned in material and methods and results analyzed as follows The patients were further divided into those below 18 years and those of or above 18 years with 24(77.4%) patients falling in the former group and 7(22.6%) patients falling in the later.

Demographic details

The mean age of onset was 12.41 ± 4.41 years (range - 7 to 21.5 years), the mean delay in diagnosis was 16.96 ± 10.716 months (range 4.92 to 42 months) and the mean age at diagnosis was 13.83 ± 4.69 years (range7.5 to 23 years). 24(77.4%) patients were juveniles (age below 18 years) and 7 (22.6%) were adults (age more than 18 years). 22(77.4%) patients were male and 7(22.6%) were female. A positive family history of WD or features suggestive of WD was noted in 15(48.4%) patients. 8(25.8%) patients had history of consanguineous parentage and they had significantly younger age at onset (p=0.04) than patients without history of consanguineous

parentage. They also had a significantly higher (p=0.0139) frequency of positive family history and shorter duration of illness at presentation. While 11(35.5%) patients were vegetarian, 20(64.5%) patients were non-vegetarian and although the age of onset was lower in vegetarian patients as compared to non-vegetarian patients, it was not significant (p=1.73). Family of 10(32.25%) patients was using copper utensils. Although their age of onset was lower than that of the whole series, it was not significant (p=0.062). 16(51.6%) patients were drinking water from handpump, 8(25.8%) were taking tap-water and 7(22.5%) were taking well water.

Clinical profile

The initial neurological features (**Table 1**) main neurological features **(Table 2)**, psychiatric features (**Table 3**) and non-neuropsychiatric features **(Table 4)** are given below.

A total of 6(19.4%) patients were having seizures. 4(66.7%) patients were in the juvenile group while other 2(33.3%) were in the adult group. The 4 juvenile patients presented with predominantly dystonic group of symptoms and the 2 adult patients had both neurological and psychiatric manifestations. 4(66.7%) patients had CPS with secondary generalization while 2(33.3%) had generalized seizures. 1(16.7%) patient also had occasional myoclonic jerks. EEG was abnormal in all 6 patients with theta background and focal and generalized discharges seen.

Investigations

A.*Hematological and laboratory parameters*

Hepatic dysfunction was defined by the presence of at least 1 of the following – bilirubin >2.0 mg/dL, serum glutamic oxaloacetic transaminase (SGOT) >100 IU/L, serum glutamic pyruvic transaminase (SGPT) >100IU/L, total protein <5.5 g/dL, or albumin <3.5 g/dL [6].

Biochemically 13(41.9%) patients were having some form of hepatic dysfunction. Hemoglobin was below 12 g/dL in 54.8% patients, significantly higher (p=0.028) in juveniles, and thrombocytopenia (platelet <100,000/mm^3) was seen in 19.4% patients.

B.Copper studies

Serum ceruloplasmin was low (<20 mg/dl) in 93.54% patients with a range varying from 4.1 to 26.4 mg/dl. 24 hour urinary copper (>100 µg/day) was increase in all 31(100%) patients with a range varying from 110.10-971 µg/day. Serum copper was low (<75 µg/dl) in 64.5% patients with a range varying from 31.7-135.8 µg/dl.

C.Neuroimaging

All the 31 patients underwent neuroimaging, 27 underwent MRI and 4 had CT scan brain done. Basal ganglia signal changes were seen in 23(85.2%) patients, and was the commonest finding observed. The most commonly affected site was the lentiform (85.2%) and especially putamen, with a distinctive lateral rim of high signal intensity on T2WI. Abnormalities in the remainder of the basal ganglia, namely, the caudate (70.4%), and the globus pallidus (33.3%) and that of thalamus, were found only in the presence of an abnormal putamen.

The second most commonly affected site was the thalamus (59.2%), followed by brainstem (51.8%) with midbrain involvement in all of them and pontine in 6(22.2%) of them. Most of these patients showed symmetrical involvement of thalamus (predominantly ventrolateral nucleus) and brainstem. In the midbrain tegmentum and substantia nigra were involved in most of the cases with red nucleus being spared. One of our cases showed typical “face of the giant panda” appearance. 10(37.03%) patients showed cerebellar changes with 50% of them having some signal changes and all of them showing atrophic changes. Higher percentage of adults showed cerebellar changes as compared to juveniles which correlates with the cerebellar presentation in most of them. Cortical atrophy was seen in 12(44.4%) patients and ventriculomegaly were seen in 9(33.3%) patients. 7(25.9%) patients showed signal changes in the white matter. Four of our patients had CT scan brain done with 3(75%) of them showing basal ganglia hypodensity, 1(25%) showing thalamic hypodensity, 2(50%) showing cortical changes and ventriculomegaly and 1(25%) patient showing cerebellar atrophy.

Discussion

Initial neurological features

Dystonia was the commonest initial neurologic feature (predominantly cranial) and was seen in (64.5%) patients and

Table 1: Initial neurological features.

S.No.	Initial neurological features	No of patients (n=31)	Age groups (in years)		P value
			<18 (n=24)	≥18 (n=7)	
1	Dystonia	20 (64.5%)	18 (75%)	2 (28.6%)	0.04
	Cranial dystonia	12 (38.7%)	10 (41.7%)	2 (28.6%)	0.43
	Limb dystonia	2 (6.4%)	2 (8.3%)	0 (0%)	0.59
	Cranial+ limb dystonia	6 (19.4%)	6 (25%)	0 (0%)	0.18
2	Dysarthria	13 (41.9%)	11 (45.8%)	2 (28.6%)	0.36
3	Drooling of saliva	12 (38.7%)	12 (50%)	0 (0%)	0.02
4	Parkinsonism	12 (38.7%)	12 (50%)	0 (0%)	0.02
5	Abnormal gait	8 (25.8%)	8 (33.3%)	0 (0%)	0.09
6	Abnormal behavior	7 (22.6%)	5 (20.8%)	2 (28.6%)	0.51
7	Tremors	5 (16.1%)	0 (0%)	5 (71.4%)	0.0001
8	Declining performance in school	3 (9.7%)	3 (12.5%)	0 (0%)s	0.45

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Table 2: Main neurological features.

S.No.	Neurological Features	No of patients (n=31)	Age groups (in years)		P value
			<18 (n=24)	≥18 (n=7)	
1.	Dystonia	26 (83.9%)	22 (91.7%)	4 (57.1%)	0.062
	Cranial onset	18 (58.1%)	14 (58.3%)	4 (57.1%)	0.64
	Cranial+limb onset	6 (19.4%)	6 (25%)	0 (0%)	0.18
	Limb onset	2 (6.5%)	2 (8.3%)	0 (0%)	0.59
	Cranial dystonia	26 (83.9%)	22 (91.7%)	4 (57.1%)	0.062
	Limb dystonia	25 (80.6%)	21 (87.5%)	4 (57.1%)	0.110
	Flexion contractures	4 (12.9%)	4 (16.7%)	0 (0%)	0.550
	Drooling of saliva	26 (83.9%)	22 (91.7%)	4 (57.1%)	0.062
	Vacuous smile	25 (80.6%)	22 (91.7%)	3 (42.9%)	0.014
2.	Parkinsonism	20 (64.5%)	20 (83.3%)	0 (0%)	<0.01
3.	Tremors	18 (58%)	12 (50%)	6 (85.7%)	0.191
	Intention tremors	7 (22.6%)	2 (8.3%)	5 (71.4%)	0.002
	Rest tremors	2 (6.5%)	2 (8.3%)	0 (0%)	1.000
	Combined (action + postural) tremors	16 (51.6%)	10 (41.7%)	6 (85.7%)	0.083
4.	Cerebellar features	7 (22.6%)	2 (8.3%)	5 (71.4%)	0.002
5.	Dysarthria	29 (93.5%)	22 (91.7%)	7 (100%)	1.000
	Muteness/ anarthria	4 (12.9%)	4 (16.7%)	0 (0%)	0.34
6.	Choreoathetoid movements	3 (9.7%)	2 (8.3%)	1 (14.3%)	0.55
7.	Dysphagia	5 (16.12%)	5 (20.83%)	0 (0%)	0.25
8.	Headache	7 (22.5%)	5 (20.83%)	2 (28.57%)	0.51
9.	Handwriting change	19 (61.2%)	13 (54.17%)	6 (85.7%)	0.14
	Micrographia	14 (45.16%)	13 (54.17%)	1 (14.3%)	0.07
	Macrographia	5 (16.1%)	0 (0%)	5 (71.4%)	0.0001
10.	Cognitive decline Impaired HMF	16 (51.6%)	11 (35.5%)	5 (71.4%)	0.22
11.	Psychiatric manifestations	13 (41.9%)	8 (33.3%)	5 (71.4%)	0.09
12.	Seizures	6 (19.4%)	4 (16.7%)	2 (28.6%)	0.596
	Myoclonus	1 (3.2%)	1 (4.2%)	0 (0%)	0.77
13.	Abnormal gait	19 (61.3%)	16 (66.7%)	3 (42.8%)	0.24
	Parkinson gait	16 (51.6%)	16 (66.7%)	0 (0%)	0.002
	Ataxic gait	3 (9.7%)	0 (0%)	3 (42.9%)	0.008
	Can't stand or walk	4 (12.9%)	4 (16.7%)	0 (0%)	0.34
14.	Pyramidal signs	4 (12.9%)	4 (16.7%)	0 (0%)	0.34
15.	Bilateral KF ring	31 (100%)	24 (100%)	7 (100%)	-

was followed by dysarthria (41.9%), drooling of saliva (38.7%), parkinsonian features (38.7%), abnormal gait (25.8%), abnormal behaviour (22.6%), tremors (16.1%) and declining school performance (9.7%). While dystonia, dysarthria, drooling of saliva and parkinsonian features were the common initial neurological feature in juvenile group, tremor was the commonest initial neurological feature in the adult group.

Main neurologic features

Among the main neurological features, the dystonic group predominated with 26(83.9%) patients showing features of dystonia. It is followed by the parkinsonian group (64.5%), cerebellar group (22.6%) and the choreoathetoid group (9.7%) in that order. Cranial onset dystonia (58.1%) was commonest in the dystonic group. Drooling of saliva and vacuous smile were seen in 83.9% and 80.6% respectively. All the dystonic features were seen in a relatively much higher percentage of juvenile patients as compared to adult patients with vacuous smile significantly much higher (p=0.014) in the former. Our data is mostly consistent with the other series reported in literature [1,5,6,9,10] **(Table 5)**. While the frequency of parkinsonian features was significantly higher (p=<0.01) in the juvenile group as compared to adult group, cerebellar features were seen significantly higher (p=0.002) in adult group as compared to juvenile group. Out of the three (9.7%) patients who manifested with choreoathetoid movements, 2 were in the juvenile group. Tremors were seen in 18 (58%) patients, 66.7% of them being juvenile. Intention tremors were seen in a significantly higher (p=0.002) proportion of adult patients as compared to juvenile patients. Two of our patients belonging to the adult group had characteristic wing beating tremors. Dysarthria was seen in 29(93.5%) patients and 4(12.9%) patients went on to develop

Table 3. Psychiatric features.

S. No.	Psychiatric features	No of patients (n=31)	Age groups (in years)		P value
			<18 (n=24)	≥18 (n=7)	
1.	Psychiatric manifestations	13 (41.9%)	8 (33.3%)	5 (71.4%)	0.09
a.	Elation	2 (6.5%)	1 (4.2%)	1 (14.3%)	0.41
b.	Apathy	1 (3.2%)	0 (0)	1 (14.3%)	0.226
c.	Schizophrenia	3 (9.7%)	0 (0)	3 (42.9%)	0.008
d.	Hallucination	2 (6.5%)	0 (0)	2 (28.6%)	0.045
e.	Depression	5 (16.12%)	3 (12.5%)	2 (28.5%)	0.31
f.	Suicidal tendencies	2 (6.5%)	1 (4.2%)	1 (14.28%)	0.41

Table 4. Non-neuropsychiatric features.

S. No.	Non-neuropsychiatric Features	No of patients (n=31)	Age groups (in years)		P value
			<18 (n=24)	≥18 (n=7)	
1.	Features of liver involvement	11 (35.5%)	9 (37.5%)	2 (28.5%)	1.000
	Jaundice	11 (35.5%)	9 (37.5%)	2 (28.5%)	1.000
2.	Epistaxis	1(3.2%)	1 (4.17%)	0 (0)	0.77
3.	Abnormal abdominal examination	12 (38.7%)	11 (45.8%)	1 (14.3%)	0.201
	Hepatomegaly	9 (29%)	8 (33.3%)	1 (14.3%)	0.639
	Spenomegaly	6 (19.4%)	6 (25%)	0 (0)	0.293
	Hepatosplenomegaly	3 (9.7%)	3 (12.5%)	0 (0)	0.45
4.	Joint pains	5 (16.1%)	3 (12.5%)	2 (28.6%)	0.582
	Knee joint	5 (16.1%)	3 (12.5%)	2 (28.6%)	0.582
	Shoulder	1(3.2%)	1 (4.17%)	0 (0)	0.77
	Hip	1(3.2%)	1 (4.17%)	0 (0)	0.77
	Ankle	1(3.2%)	1 (4.17%)	0 (0)	0.77

anarthria and muteness. 5(16.2%) patients complained of dysphagia. These symptoms were more common in juvenile group of patients. Change in handwriting was seen in 19(61.2%) patients of which 14(45.16%) had micrographia and 5 (16.1%) had macrographia. Micrographia was seen in a higher percentage of juvenile patients and macrographia was seen in a significantly higher [p=0.0001] percentage of adult patients.

Impaired higher mental function with cognitive decline was seen in 16(51.6%) patients of which 11(68.75%) were juvenile. Psychiatric complaints were noted in 13(41.9%) patients and seen in a higher percentage of adult patients with schizophrenia and hallucinations being significantly higher (p=0.008 and 0.045 respectively) in adults as compared to juveniles. Seizures were seen in 6(19.4%) patients, 4(66.7%) being juveniles. 4(66.7%) patients had CPS with secondary generalization while 2(33.3%) had generalized seizures. 1 patient also had occasional myoclonic jerks. EEG was abnormal in all 6 patients. In 4(66.7%) patients seizure started before initiating decoppering therapy while in 2(33.3%) patients it started later. All the patients responded well to antiepileptics. Headache was seen in 7(22.5%) patients. Gait abnormality was noted in 19(61.3%) patients with parkinsonian gait significantly higher (p=0.002) in juvenile patients and ataxic gait significantly higher (p=0.008) in adults. Pyramidal signs were seen in 4(12.9%) patients. Bilateral KF ring was seen in all the patients. Features suggestive of liver involvement during the course of present illness or in the past were seen in 11(35.5%) patients.

Investigations

KF rings were seen in 100% of the neurologically symptomatic patients as reported by Brewer GJ and Yuzbasiyan-Gurkan V [11] and this is consistent with the observations made in other Indian series. Copper studies: are comparable with the study by Brewer et al., [12] and other Indian studies of the 31 patients, 4 underwent CTscan and rest 27 underwent MRI brain. We found the basal ganglia were the most frequently affected site (85.2%) and always involved the putamen (85.2%), followed by caudate (70.4%), and the globus pallidus (33.3%). Our observations were consistent with the findings of King et al., [13], SSinha et al. [10], Pangariya et al. [5], and Taly et al. [6].

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Table 5. Comparison of main neurological features with other series.

S. No.	Neurologic features	Walshe et al., (1992) (n=136)	Jha et al., 1998 (n=22)	Sinha et al., (2001) (n=49)	Pangariya et al., (2007) (n=21)	Taly et al., (2007) (n=268)	Present study (n=31)
1.	Dystonia	21 (15%)	12 (54.5%)	47 (95.9%)	12 (57.1%)	95 (35.4%)	26 (83.9%)
	Cranial dystonia	-	-		-	-	26 (83.9%)
	Limb dystonia	-	-	46 (93.8%)	-	-	25 (80.6%)
	Flexion contractures		-		-	-	4 (12.9%)
	Drooling of saliva		5 (22.7%)	33 (67.3%)	9 (42.8%)	-	26 (83.9%)
	Vacuous smile	10 (7.3%)	4 (18.2%)	45 (91.8%)	-	-	25 (80.6%)
2.	Parkinsonian features	61 (45%)	18 (81.8%)	22 (44.9%)	-	167(62.3%)	20 (64.5%)
3.	Tremors	40 (29.4%)	8 (36.4%)	23 (46.9%)	18 (85.7%)	-	18 (58%)
	Intention tremors	-	-	-	-	-	7 (22.6%)
	Rest tremors	-	-	-	-	-	2 (6.5%)
	Combined tremors	-	-	-	-	-	16 (51.6%)
4.	Cerebellar features	33 (24%)	11 (50%)	13 (26.5%)	7 (33.3%)	75 (27.9%)	7 (22.6%)
5.	Choreoathetosis	15 (11%)	11 (50%)	-	3 (14.2%)	24 (8.9%)	3 (9.7%)
6.	Dysarthria	53 (38.9%)	11 (50%)	39 (79.6%)	16 (76.2%)	-	29 (93.5%)
7.	Muteness (anarthria)	-	2 (9.1%)	-	-	-	4 (12.9%)
8.	Dysphagia	-	-	3 (6.1%)	-	-	5 (16.12%)
9.	Impaired HMF	-	17 (77.2%)	35 (71.4%)	12 (57.1%)	62 (45.6%)	16 (51.6%)
10.	Handwriting change		5 (22.7%)	-	-	-	19 (61.2%)
	Micrographia		-	-	-	-	14 (45.1%)
	Macrographia		-	-	-	-	5 (16.1%)
11.	Psychiatric manifestations	44 (32.3%)	-	21 (42.8%)	-	43 (31.6%)	13 (41.9%)
12.	Seizures	-	2 (9.1%)	11 (22.4%)	8 (38%)	20 (7.7%)	6 (19.4%)
	Myoclonus	-	-	3 (6.1%)		9 (3.3%)	1 (3.2%)
13.	Abnormal gait	-	12 (54.5%)	-	10 (47.6%)	-	19 (61.3%)
	Parkinson gait	-	-	-	-	-	16 (51.6%)
	Ataxic gait	-	-	-	-	-	3 (9.7%)
	Can't stand or walk	-	-	-	-	-	4 (12.9%)
14.	Pyramidal signs	-	7 (31.8%)	19 (38.7%)	-	43 (16.04%)	4 (12.9%)
15.	Headache	-	-	-	-	-	7 (22.5%)

Treatment

13(41.9%) patients improved completely and returned to pre-disease level of functioning; 12 (38.7%) patients showed incomplete improvement with sequelae and could not return to their pre-disease level of functioning; 4 (12.9%) patients remained status quo and were lost in follow up and 2(6.45%) patients deteriorated and died. Our observation is consistent with those of Walshe et al. [14] who reported that of their 137 patients treated with penicillamine, 41% did excellent, 21% did well, 17% did poorly, and 17% died. The percentage of patients showing no response to treatment (12.9%) was comparable to that observed by Walshe et al., [14] (17%) and Pangariya et al., (14.3%).

Conclusion

This series of Wilson's disease from Eastern India highlights that the disease is not that rare in India and has varied clinical presentations. Dystonia and parkinsonian features are the commonest clinical presentations in juvenile patients, while the elderly group of patient showed predominantly cerebellar features. Screening of all asymptomatic siblings for Wilson disease is a very important issue and must be carried out in all. Early and correct diagnosis and institution of proper treatment and lifelong continuation can prevent devastating consequences as the disease is treatable.

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