

**Original Research Article****A Study to Evaluate the effect of Different Physical Medicine Modalities in Hansen's Neuropathy**

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**Abstract**

*Hansen's disease (also called Leprosy), a chronic granulomatous disease caused by an acid and alcohol fast bacillus Mycobacterium Leprae, mainly affects the peripheral nerves along with skin and mucous membrane. The peripheral nerves, affected mainly in multibacillary leprosy and during leprosy reactions, manifests as sensory loss (like anaesthetic foot), motor paralysis (like intrinsic minus hand, foot drop) and autonomic dysfunction (like dryness of skin) collectively called Hansens's neuropathy and the resultant deformity in longstanding untreated patients. In addition to drug treatment, different types of physical medicine modalities like therapeutic exercises, orthosis, massage, electrical stimulation and modified shoe/slipper are usually advised for its management. Fifty patients of both sexes and different age groups attending outdoor of Physical Medicine and Rehabilitation (PMR) Department, Bankura Sammilani Medical College were selected for this prospective analytical study with the aim to evaluate the effect of these nonpharmacologic management. The results of the study showed that 79.3% and 61.5% of the affected nerves presented within 6 months of appearance of symptoms, recovered sensory and motor power satisfactorily. On the other hand, 57.6% and 6.6% of nerves affected in the disease process presented after 6 months of symptoms recovered their sensory and motor function satisfactorily. Excellent hand function and foot-ankle range of motion (ROM) were achieved by 60% of affected hands and 30% of foot-ankle affected by the disease who presented within 6 months of symptoms. However only 5.9% of hands and 12.5% of foot-ankle were achieved excellent functional score of the cases presented after 6 months of symptoms. These results indicate that nonpharmacologic therapies including physical therapy have a definite role in treating the patient of Hansen's neuropathy in conjunction with drug therapy, different physical medicine therapies should be started as early possible for better improvement of nerve function and to prevent contracture, but established deformities cannot be corrected fully with these therapies.*

**Keywords:** Hansen's Disease, Leprosy, Neuropathy, Nonpharmacologic Treatment, Physical Therapies, Orthosis.

**Introduction**

Hansen's disease (also called Leprosy) is a chronic granulomatous disease caused by

Microbacterium Leprae, an acid and alcohol fast bacillus. It affects mainly the peripheral nerves, skin and mucous membrane. As per NLEP report

(2014-15)<sup>1</sup>, a total of 125785 new cases were detected in India during the year 2014-15, which is 60% of global new leprosy cases. Nearly 20% of leprosy patients suffer from grade 2 disability mainly due to neuropathy<sup>2</sup>. The disease is classified into tuberculoid (TT) borderline tuberculoid (BT), Borderline (BB), borderline lepromatous (BL) and lepromatous (LL) types based on clinical, bacteriological, immunological and histological status of patients (Ridley-jopling classification)<sup>3</sup>. The Indian classification consists of indeterminate (I) tuberculoid(T) borderline(B), lepromatous (L) and polyneuritic(P) types according to clinical and bacteriological examination. For drug treatment leprosy is classified as paucibacillary (PB) and multibacillary (MB) leprosy.

The peripheral nerves are affected mainly in multibacillary leprosy and during leprosy reactions, manifests as sensory loss (like anaesthetic foot), motor paralysis (like claw hand, foot drop) and autonomic dysfunction (like dryness of skin) collectively called Hansen's neuropathy. For the management of these Hansen's neuropathy case different types of physical medicine modalities like exercise, splint, massage, electrical stimulation and shoe modification are needed with medical therapy.

### Aims & Objectives

The study was conducted with the aim to evaluate the result after treating selected patients suffering from Hansen's neuropathy with different physical medicine modalities along with the drug therapy.

### Materials and Methods

This study has been carried out in Physical Medicine and Rehabilitation (PMR) Department, Bankura Sammilani Medical College. Fifty patients of both sexes and different age groups attending outdoors were selected as per inclusion criteria for this prospective analytical study. All patients chosen for this study were diagnosed clinically according to WHO 1998 criteria, where patients had involvement of the peripheral nerves as

demonstrated by definite thickening with loss of sensation along the nerve distribution, with or without hypopigmented or reddish skin lesion, motor loss or tender nerve trunk. Immunosuppressed patients, patients suffering from collagen vascular disease or definite neurological disease other than leprosy were excluded from the study. Informed consent was obtained from all the individuals and study was carried out in accordance with the institutional ethical committee guidelines.

### Assessment

After taking detailed history of the selected patients regarding age, sex, occupation, presenting symptoms, duration of disease, duration of drug treatment etc, all the nerve trunks which are commonly affected in Hansen's disease were examined in following sites.

- Ulnar nerve: immediately above the ulnar groove.
- Median nerve: in front of the wrist between the tendon of palmaris longus and flexor carpi radialis.
- Radial nerve: at the radial groove of the humerus posterior to the deltoid insertion.
- Lateral popliteal nerve: around the neck of fibula.
- Posterior tibial nerve: posterior and inferior to the medial malleolus.
- Zygomatic branch of facial nerve: over the zygoma.

The palpated nerves were compared with those of opposite side of the body. Any doubtful thickening was not considered as thickened nerve. Tenderness of the nerve during palpation was also noted and tests for sensory deficit & motor power examination were done and recorded. Medical Research Council's 6 point (Grade 0 to Grade 5) scale was used for motor power estimation. Sensation was graded on a 6 point (Grade 0 to Grade 5) scale where Grade 0, 1, 2, 3, 4 and 5 denote no sensation, deep pressure sensation, pain sensation, touch pressure sensation, light touch and/or temperature sensation and normal sensation with two point discrimination respectively. Neuropathy was

confirmed by nerve conduction velocity (NCV) test. Leprosy and its classification were confirmed by skin biopsy done in the Department of Pathology.

After taking history and doing necessary clinical examination and investigations, patients were taken to gymnasium of physiotherapy section. Physical therapy with various modalities was arranged as per requirement. Patients were followed up to 2 years for the period from June 2017 to May 2019. Results were noted and analysed.

### Treatment

Regarding treatment, patients were advised anti-leprotic drugs as per WHO schedule for paucibacillary and multibacillary cases. Steroids and other necessary drugs were also given according to patient requirement and leprosy control programme. Nonpharmacologic managements consisted advice on general measures and specific therapeutic exercises, physical modalities, occupational therapies and orthosis.

**1. General Measures:** Patients were advised to inspect the hands for wounds as a routine at the end of day and not to use sharp or hot object. They were also advised to rest affected hands in a position that will avoid contracture.

They were instructed to soak the affected foot including lower leg in bucket of warm water for 15 to 20 minutes, to wipe off the excess water with a towel and then to rub petroleum jelly over the skin to keep the water in. Specific instruction to repeat the routine daily was given. If cracks and fissure had developed, the heaped up thickening of the cuticle around the edges was excised and depth of the crack was painted with povidone-iodine ointment.

Patients with insensitive feet were advised to take following precautions:

- Inspection of the feet at the end of each day for thorn prick wounds, giving them immediate attention.
- Wearing of shoes or sandals that are not made with nails.

- Limiting walking, particularly over hard paved roads and severe limitation of the use of the foot in event of injury or infection.

When an ulcer had formed the treatment of ulcer was as follows:

- Bed rest with foot elevated.
- Daily dressing with hypertonic magnesium sulphate solution or with a mild antiseptic.

When the acute stage had subsided and there was no sign of spread of infection, the wound was entirely explored with a sterile blunt probe to see whether bone was exposed. If the bone was exposed rest was continued. If wound was localised, bone was not exposed and there was no infection, a plaster of pairs cast was applied to immobilise the foot.

**2. Exercise Therapy:** Patient with muscle power "0" and "1" were given passive range of motion exercise. Patients with grade 2, grade 3 and grade 4 were advised assisted active exercise, active exercise & resistive exercise respectively.

**3. Electrical Stimulation:** For therapeutic purposes, interrupted direct current (or galvanic current) of long duration usually with 100 millisecond were used with a frequency of 30 cycles per minute upto 90 contractions in each sitting (1 sitting daily) 6 days in a week were given.

**4. Wax Bath:** Mild heating (around 42<sup>0</sup> C to 44<sup>0</sup> C) was done very carefully for lubricating effect and to soften the skin in the area of soft tissue contracture. Wax was added with liquid paraffin and Vaseline in a ratio of 3:1:1. It was not used over the skin with total sensory loss and with presence of ulcer.

**5. Orthosis:** Metacarpo-phalangeal (M-P) flexor orthosis, commonly called "dynamic-knuckle benders" were used in patients with claw hand while opponens splints and dynamic cock-up splints were used for median nerve lesion and for wrist drop respectively. Different types of shoes and slippers appropriate for anaesthetic foot were used according to patient's preference. Shoes with soft inner lining with stitches instead of nails, upper made of soft calf leather and rigid outsole with rocker bottom effect to maintain heel toe

rhythm usually of one size bigger were prescribed. Micro-cellular rubber (MCR) slipper with heel counter and with arch support were used. Below knee (B.K.) calliper with posterior spring for foot dorsiflexion during swing phase of gait cycle were used for foot drop.

**6. Occupational therapy:** Occupational therapy was given with the aims to create self dependence, to improve function of the part, to improve muscle power, to prevent muscular contracture and to prevent deformity.

**Functional Assessment:** Hand: Functional assessment of hand was done by the different performances of the patients and points were given according to the level of performance. (Table 1)

Grasp power was tested by Swanson tourniquet test. The cuff of sphygmomanometer was rolled on a wooden roller and inflated to 50 mm of Hg. The patient was instructed to squeeze the bulb. The rise of pressure as shown by the rise of mercury column was recorded. Pinch power was assessed by instructing the patient to oppose his/her thumb with the pulps of other fingers and to give pressure over neonatal sphygmomanometer cuff which was inflated to 50 mm of Hg. The rise of pressure was noted. Patient's score was noted out of total points of 15 in the first and following visits.

Foot: Functional assessment of foot was done only by measuring the active range of motion (ROM) of the foot from extreme planter flexion to dorsiflexion against gravity in sitting posture with knee flexed at 90° with the help of goniometer.

Patients were also assessed regarding self-care activities like feeding, dressing, bathing, toileting; walking on plain ground, stair climbing during first and following visits.

### Results and Analysis

Most of the Hansen's neuropathy patients were within the age group of 31 to 40 years. Mean age was 32.7 years with standard deviation of 12.9 years. 16% patients were within 20 years of age.

Male to female ratio was 1.63:1. The females predominantly belonged to slightly younger age group than males.

As far as economic status was concerned, 68% of the patients belonged to low income category while only 4% were from high income group and the remaining 28% were from the middle income group.

38% patients were involved in manual labour. 20% were engaged in household work, all of them were female. 16% patients were involved in clerical jobs. Most males were manual labour, clerks and farmers whereas most females were occupied in household work.

60% patients in this study were with secondary education, 28% were with primary education, only 8% patients were with college education and 4% of total patients were illiterate.

35.5% patients presented with numbness along the nerve distribution and 27.4% patients complained of weakness. 14.5% presented with pain. Rest of the patients presented with deformity, burning or tingling sensation along the nerve distribution and wasting of foot muscles leading to frequent slipping out of slippers.

Most patients (80%) were affected with single nerve lesion and 20% patients were affected with double or more nerve lesions.

Different nerves were found to be involved with ulnar nerve being the commonest of them. (Table 2) Duration of nerve involvement in our study was found to be different at the time of presentation. (Table 3)

Maximum number of nerve involvement (37.1%) were presented in between 6 and 12 months. 14.6% nerves had come within 1 month. Rest of the nerves were in the group of 1-3 months, 3-6 months and  $\geq 12$  months, which were equal in number (each 16.1%).

Multibacillary cases were 58% which was more than paucibacillary cases (42%), MB males were significantly greater than MB females, whereas PB females were more than PB males.

Sensory score of the nerves with initial involvement of less than six months as well as those with

initial involvement of more than six months were calculated before and after treatment. (Table 4 & Table 5) The scores were compared using appropriate statistical tools.

There was strong positive correlation between the sensory score of nerves before and after final treatment if the affection was of less than 6 months duration. ( $r = 0.9337$  i.e. strong positive correlation.  $Z$  value = 5.28, so,  $p < 0.05$ , highly significant.) A negative correlation was found between sensory scores of the nerves before and after treatment if affection was of more than 6 months duration. (Pearson's correlation coefficient  $r = 0.2154$  i.e. no correlation.  $Z/t$  value = 1.14. So,  $p > 0.05$ , is not significant.)

Similarly, motor score of the nerves with initial involvement of less than six months as well as those with initial involvement of more than six months were calculated before and after treatment. (Table 6 & Table 7) The scores were compared using appropriate statistical tools.

There was strong positive correlation between motor score of nerves before and after treatment if affection was for less than 6 months. ( $r = 0.9341$ , strong positive correlation,  $z = 5.03$ . So,  $p < 0.05$ , highly significant)

There was negative correlation between motor scores of nerves before and after treatment if affection was more than 6 months. ( $r = 0.3969$ , no correlation,  $t$  value = 1.98. So,  $p > 0.05$ , not significant)

Functional score of the hands with initial involvement of less than six months as well as those

with initial involvement of more than six months were also estimated before and after treatment. (Table 8 & Table 9) The scores were compared using suitable statistical tools.

It was seen that more than half of the hands (60%, 9 out of 15 hands) had attained full functional score (13-15) and another 33.3% hands scored in between 9-12. Among those who received physical therapy within 6 months of their symptoms. Only 6.7% of hands had poor (5-8) score in this group. Whereas, in the group of patients receiving physical therapy after 6 months of their symptoms, only 1 out of 17 hands (5.9%) had fully functional score (13-15), and another 6 hands (35.3%) had scores in between 9-12. Most of the patients (58.8%) of this group had showed poor (5-8) or very poor (0-4) score.

Active ROM of ankle against gravity score with initial involvement of less than six months as well as those with initial involvement of more than six months was calculated before and after treatment. (Table 10 & Table 11) The scores were compared using appropriate statistical tools.

It was found that out of 10 feet of involvement duration of less than six months, 3 feet (30%) improved excellent ( $\geq 60^\circ$ ), 1 foot (10%) improved good ( $50^\circ-59^\circ$ ), 4 feet (40%), showed poor improvement ( $40^\circ-49^\circ$ ) and 2 feet (20.0%) showed poor ( $0-39^\circ$ ) improvement, whereas out of 8 feet with involvement of more than six months, 1 foot (12.5%) was in each excellent ( $\geq 60^\circ$ ) and good ( $50^\circ-59^\circ$ ) group. Remaining 6 feet (75%) were in very poor ( $0-39^\circ$ ) group.

**Table 1:** Functional Assessment of Hand

Items	Point scored			
	3	2	1	0
i. Grasp power	>150	100-149	60-99	<60
ii. Pinch power	>150	100-149	60-99	<60
iii. Pins counting in 30 sec	>15	8-14	1-7	0
iv. Drawing 4 shapes in 30 sec in 1 inch square area	>10	5-9	1-4	0
v. Bottom opening & closing in 30 sec	>6	3-5	1-2	0



**Table 2:** Affection of different nerve trunks in hansen’s neuropathy [n=62]

Nerves	No. of cases	Percentage
Ulnar	28	45.1
Common peroneal	18	29.1
Median	10	16.1
Posterior tibial	6	9.7
Total	62	100.0

**Table 3:** Duration of Nerve Involvement at Presentation [n=62]

Status	No. of cases	Percentage
Within 1 month	9	14.6
1 to 3 months	10	16.1
3 to 6 months	10	16.1
6 to 12 months	23	37.1
≥ 12 months	10	16.1
Total	62	100.0

**Table 4:** Pre & Post treatment sensory score of the nerves with involvement of less than 6 months [n=29]

Sensory score in percentage	No. of nerves before treatment (%)	No. of nerves after treatment(%)
0 - 19	9 (31.0%)	1 (3.5%)
20 - 39	10 (34.5%)	-
40 - 59	9 (31.0%)	5 (17.2%)
60 - 79	1 (3.5%)	8 (27.6%)
≥ 80	-	15 (51.7%)
<b>Total</b>	<b>29 (100.0)</b>	<b>29 (100.0%)</b>

**Table 5:** Pre & Post treatment sensory score of the nerves with involvement of more than 6 months [n=33]

Sensory score in percentage	No. of nerves before treatment (%)	No. of nerves after treatment(%)
0-19	5 (15.2%)	2 (6.1%)
20 – 39	5 (15.2%)	4 (12.1%)
40 - 59	10 (30.3%)	8 (24.2%)
60 - 79	7 (21.2%)	9 (27.3%)
≥ 80	6 (18.10%)	10 (30.3%)
<b>Total</b>	<b>33(100.0%)</b>	<b>33 (100.0%)</b>

**Table 6:** Motor Score before and after treatment of the nerves affected for less than 6 months [n=26]

Motor score in percentage	No. of nerves before treatment (%)	No. of nerves after treatment (%)
0 – 19	14 (53.8%)	3 (11.5%)
20 – 39	7 (27.0%)	3 (11.5%)
40 – 59	5 (19.2%)	4 (15.4%)
60 – 79	-	8 (30.8%)
≥ 80	-	8 (30.8%)
<b>Total</b>	<b>26 (100.0)</b>	<b>26 (100.0%)</b>

**Table 7:** Motor Score before and after treatment of nerves affected for more than 6 months: [n=30]

Motor score in percentage	No. of nerve before treatment (%)	No. of nerves after treatment
0-19	15(50.0%)	13(43.4%)
20-39	11(36.7%)	7(23.3%)
40-59	3(10.0%)	8(26.7%)
60-79	1(3.3%)	1(3.3%)
≥ 80	-	1(3.3%)
<b>Total</b>	<b>30(100.0%)</b>	<b>30(100.0%)</b>

**Table 8:** Functional Assessment score of hands affected for less than 6 months at presentation [n=15]

Score	No. of hands before treatment	No. of hands after treatment (%)
0- 4	4(26.7%)	-
5-8	4(26.7%)	1(6.7%)
9-12	7(46.6%)	5(33.3%)
13-15	-	9(60.0%)
Total	15(100.0%)	15(100.0%)

**Table 9:** Functional Assessment Score of hands affected for more than 6 months at Presentation [n=17]

Score	No. of hands before treatment (%)	No. of hands after treatment (%)
0 – 4	8 (47.0%)	2 (11.8%)
5 – 8	9 (53.0%)	8 (47.0%)
9 – 12	-	6 (35.3%)
13 – 15	-	1 (5.9%)
Total	17 (100.0%)	17 (100.0%)

**Table 10:** Active Range of Motion of Feet affected less than 6 Months: [n=10]

Active range of motion of foot in degrees	No. of feet before treatment (%)	No. of feet after treatment (%)
0-39	9(90.0%)	2(20.0%)
40-49	1(10.0%)	4(40.0%)
50-59	-	1(10.0%)
≥ 60	-	3(30.0%)
Total	10(100.0%)	10(100.0%)

**Table 11:** Active Range of Motion of Feet affected more than 6 months [n=8]

Active range of motion of foot in degrees	No. of feet before treatment (%)	No. of feet after treatment (%)
0-39	7(87.5%)	6(75.0%)
40-49		
50-59	1(12.5%)	1(12.5%)
≥ 60	-	1(12.5%)

## Discussion

Leprosy is a disease which principally involves the peripheral nerves and is recognised as the major cause of infective polyneuropathy in our country. It produces more morbidity than mortality due to late sequelae of nerve damage either due to the disease process itself or through reaction.

50 consecutive patients suffering from Hansen's neuropathy were included in the study. Total 62 nerves of 50 patients were studied with the intention of analysing the results of management by physical therapy adjunct to drug therapy.

It was evident from this study that maximum number of patients (34%) were within the age group of 31-40 years. Incidence of Hansen's neuropathy was much less above 50 years and below

10 years. Mean age was 32.7 years (range 9-64 years). Male to female ratio was 1.63: 1. Our study results corroborate with the previously published studies like one done by Croft et al<sup>4</sup> which showed that mean age in their study was 35.3 years (range 8-70 years) with male to female ratio of 1.7: 1 and another one done by Van Brakel and Khawas<sup>5</sup> where it was found that the mean age is 40 years (range 11-70 years) and the sex ratio is 1.3 : 1(male : female).

Some predisposing factors have been identified to make a person more prone to develop neuropathy in Hansen's disease. From this study, it was seen that persons from low economic status and manual labours were more vulnerable to develop Hansen's neuropathy. These factors were also ob-

served by Smith<sup>6</sup> in his study. He commented that disability increases with poor socio-economic status, low educational attainment, occupation with manual labour and lepomatous end of disease.

Multibacillary (MB) cases were found more than paucibacillary (PB) cases with a ratio of 1.4 : 1 (MB: PB). This was similar to the study done by those of Van Brakel and Khawas<sup>5</sup> where the result was 1.5: 1 (MB:PM) .

Most patients (62.9%) presented with the symptoms of numbness (35.5%) and weakness (27.4%). This was similar to study of Talwar et al<sup>7</sup> where these two types of symptoms were 72%.

Most patients (80%) in this study presented with single nerve lesion rather than two or more nerves lesions.

The most frequently affected nerves in this study were the ulnar (45%) and common peroneal nerve (29.1%) followed by median and posterior tibial nerve which was also similar to the study of Minauchi Y and Igata A<sup>8</sup>. This differs slightly from that of Brakel and Khawas<sup>5</sup> where involvement of ulnar nerve was highest followed by facial, common peroneal and median nerve. In this study, no patient presented with facial nerve involvement.

It is generally believed that corticosteroid treatment is effective in cases with neural impairment of 'recent onset'. Usually an arbitrary time limit 6 months duration is chosen as a definition of 'recent onset'<sup>9</sup>. Among the patients who present themselves 6 months after the onset of symptoms, some of them have already completed multi-drug regime and steroid course. Practically these patients start physical therapy after 6 months of symptoms. Other group starts physical therapy before 6 months of symptoms. There was a striking difference of the results (specially the motor score) in relation to improvement of function in these two groups of nerve involvements. In pre 6 months group, a total of 96.5% of nerves showed sensory improvement and 84.6% of nerves showed motor improvement. 79.3% and 61.5% of nerves recovered sensation and motor power satisfactorily (score 60 in percentage). However, in

post 6 months group, a total of 66.6% of nerves showed sensory improvement and 33.3% of nerves showed motor improvement. 57.6% and 6.6% of nerves recovered their sensory and motor power satisfactorily (score  $\geq 60$ ). Croft et al<sup>4</sup> experienced sensory improvement of 61.5% of patients and motor improvement of 49.4% of patients. Srinivasan et al<sup>10</sup> reported that in a sample of 25 patients with 'quiet nerve paralysis' 83% of nerves with paralysis of 1 – 13 weeks duration recovered satisfactorily and only 53% of nerves with paralysis of long duration improved satisfactorily (VMT score of 3+ or more on the MRC scale). The present study showed somewhat better result than study of Croft et al<sup>4</sup>. But there is marked difference with the study of Srinivasan et al<sup>10</sup>.

Hand and foot-ankle function were also improved more of the patients who came within 6 months of appearance of symptoms. Hand functions improvement is excellent in 60% and good in 33.3% of the patients in pre 6 months group. Whereas, in patients of post 6 months group excellent and good improvement occurred in 5.9% and 35.3% of hands respectively. Regarding foot-ankle function, it was seen that 30% and 10% of foot-ankle achieved excellent and good score in the patient of pre 6 months group. Only each of 12.5% of foot-ankle achieved excellent and good score in post 6 months group. 70% of foot-ankle showed very poor score in post 6 months group. But, only 20% of foot ankle showed very poor improvement in the pre 6 months group.

63% of nerves were associated with anhydrosis/hypohydrosis along the nerve distribution at the beginning of study. Only 30.6% of nerves persisted with the symptom. Rest of the nerves recovered sweating at the end of the study. Amongst all the nerves that were thickened, 46.8% of nerves were tender. So, it can be concluded that nerve tenderness should not be considered as a sole criteria for Hansen's neuropathy. 9 nerves were presented within 1 month of their symptoms. They were studied with strength-duration (S-D) curve before and after treatment. 5



nerves with step-rise pattern and 4 nerves with kink in the curve were found before treatment. After final treatment, there were 6 nerves with 'kink in the curve' pattern and 3 nerves with exponential curve. All the graph of the nerves shifted to the left except one nerve, which showed no shifting of the curve. Shifting of the curve to the left denotes re-innervation of the muscles.

Patients with longstanding neuropathy developed contractures in the involved parts. With physical therapy the contractures improved partially or completely. The deformities were not much improved. Patients who did not respond to any conservative therapy were referred to the department of plastic-surgery for tendon transfer operations.

Regarding self-care and locomotion, almost all the patients were independent except two cases. They required partial assistance for self-care activities but not for locomotion.

### Summary

The mean age was 32.7 years (range 9 – 64); 31 out of 50 patients were male. 58% and 42% of the total patients were multibacillary and paucibacillary cases respectively. Most patients (53%) presented with numbness along the nerve distribution and weakness of muscles of the involved part. Maximum numbers of patients were married (64%), from low income group (68%), having secondary education (60%), with occupation of manual labour and household work (58%). Mono-neuritis commonly occurred with affection of ulner nerve (45.1%) followed by common peroneal, median and posterior tibial nerves. 29 nerves presented within 6 months of onset of the symptom.

The physical medicine modalities employed included therapeutic exercise, electrical stimulation, wax bath, orthosis in appropriate cases.

The result of the study indicate that 79.3% and 61.5% of the nerves presented within 6 months of appearance of symptoms, recovered sensory and motor power satisfactorily (score  $\geq 60$  in percentage). On the other hand, 57.6% and 6.6% of nerves presented after 6 months of symptoms re-

covered their sensory and motor function satisfactorily (score  $\geq 60$ ). Excellent hand function (score 13-15) and foot-ankle range of motion ( $60^{\circ}$ - $70^{\circ}$ ) were achieved by 60% of hands and 30% of foot-ankle who presented within 6 months of symptoms. However only 5.9% of hands and 12.5% of foot-ankle were achieved excellent functional score of the cases presented after 6 months of symptoms.

Most of the patients are independent regarding self-care and locomotion.

### Conclusion

This study has shown that:

- 1) Different physical medicine therapies and management modalities have a definite role in treating the patient of Hansen's neuropathy in conjunction with drug therapy.
- 2) Nonpharmacologic therapies should be started as early possible for better improvement of nerve function and to prevent contracture.
- 3) It's not possible to correct established deformities fully with these therapies.

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