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Research Paper

A Clinical Investigation and Comparative Study of Life Assessment in Transtibial Amputee-A Gender Based According to Activity of Daily Living

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ABSTRACT

Background: Based on gender, there are fundamental differences in ADL and experience of quality of life among trans tibial amputees. **Objective:** To assess the ADL and quality of life of transtibial amputees (Male and Female). **Study Design:** Cross-sectional study. **Methods:** 48 male and 42 female transtibial amputee patients were taken in our study. Demographics data, level of amputation, and type of prosthesis use were evaluated. Barthel Index for ADL and TAPES-R (Trinity Amputation and Prosthesis Experience Scales – Revised) were performed. **Results:** The Barthel Index and TAPES-R score was statistically evaluated. Men were superior in all activity comparative to female. **Conclusion:** Men have a better quality of life than women and they are more likely to be satisfied with the aesthetic, fit, and comfort of their prostheses as compared to women. **Clinical relevance:** Although there are differences between the groups, patients can still reach a standard of living that is acceptable with good rehabilitation and a proper prosthesis. Women amputees need to get extra attention and training to attain a better quality of life and ADL.

Keywords: *Transtibial Amputees, ADL, Quality of Life, Gender*

The Census data 2011 says that, there are 14.9 million men with disabilities and 11.9 million women in the country. The percentage of men with disabilities is 2.41 per cent whereas 2.01percent in women. Out of the 121 Crore population in India 2.68 crore persons were enumerated as 'disabled' which was 2.21% of the total population. Among the disabled population 56% were males and 44% were females. Out of total 58.76 crore female Indian citizens, there are 1.18 crore (11.8 million) disabled females in India. The prevalence of disability in Odisha is the second highest in the country with about 2.5% of the total population having some form of disability[1].According to NSS, 1% of the total population of India are locomotor impaired.

Person with Locomotor Disability is 1.8%.out of whish male is 2% & female is 1.6% lower limb amputation accounts for 94.8% of all amputations. The major cause of amputation is

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trauma. Lower limb amputation not only affect a person's ability to walk, but may also decrease his participation in other important and valued activities.

Lower limb amputations can cause patients to face various problems in their daily lives. After using a prosthetic device their quality of life improves significantly. But, this improvement has a difference between male and female amputees which needs to be defined statistically. Many previous studies are based on mainly unilateral vs bilateral amputees [2] and specific amputees like war veterans [3] and general lower limb amputees [4].
Studies specifically based on ADL, mobility and quality of life of male vs. female transtibial amputees is rare.

CLINICAL RELEVANCE-our study aims to quantitatively assess the difference between male and female transtibial amputees by taking consideration of ADL, quality of life, and mobility after wearing a prosthesis.in developed countries quality of life have been investigated and published in many articles. There is a very little evidence in developing country like India. These self-report measures can be valuable in monitoring ADL activities, social adaptation and the impact of prosthetic intervention.

MATERIAL AND METHOD

Participants:

This study was conducted at Swami Vivekananda National institute of Rehabilitation Training and research (SVNIRTAR), Cuttack which is a rehabilitation centre. In this study identified as 48 male and 42 female unilateral (90) transtibial amputees (aged 23-57 years) were assessed who had been using modular transtibial prosthesis prior to 1 year before from data collection.

Individuals were included having

1) Unilateral transtibial amputation,
2) Age 20 -60 years,
3) Amputation etiology identified as traumatic
4) Both male & female
5) Able to read and write English or Odia
6) Using modular prosthesis 1 year before of study period.

Individuals were excluded

1) If they had partial foot amputation,
2) Bilateral amputations,
3) The time since amputation did not fall within the noted periods.
4) Congenital amputee
5) Amputation due to diabetes

All the subjects were enrolled after the completion of 1 year usage period of the prosthesis and none of them were part of any other study program. The subjects were thoroughly known about the study and gave their written consent to participate and can withdraw anytime in between study period.

All the prostheses were evaluated, and fabricated and are under follow-up at Swami Vivekananda National Institute of Rehabilitation and Training center. The participants were taken randomly who attended the clinic during a period of 12 months in 2022. Out of 90

patients, 56 were using Patellar tendon bearing (PTB), 22 were using PTB SC (Supra condylar), and 12 were using PTB SC-SP (Supra Condylar-Supra patellar) design socket along with ALIMCO below-knee prosthetic kit and SACH foot. 67 of them were using cuff suspension and 23 of them were using an elastic sleeve suspension system.

Ethical guidelines were followed. Before data collection research protocol were explained in detail like purposes, procedures, benefits and potential risks involved in the study.

Data of the transtibial amputee patients that were collected including socio demographic characteristics (Table1) Participants completed the Barthel Index and TAPES-R (Trinity Amputation and Prosthesis Experience Scales – Revised) scale for the evaluation of ADL and prosthesis experience. Interviews were conducted individually in prosthetic department of SVNIRTAR in a face-to-face manner in the prosthetic rehabilitation center and the duration was approximately 1 hour.

The Barthel scale was created as a way to gauge someone's level of handicap when their condition prevented them from using their limbs independently[5]. It is the most reliable and widely used ordinal index which evaluates 10 basic and important items for daily routine activities related to self-maintenance and mobility. Which includes personal activities: feeding, personal hygiene, dressing and bladder control etc? The 3-point ordinal rating scale was applied which was completed within 2-5 minutes and the final score was compared with the 100-point full score [6.]

The TAPES-R scale measures broad assessment of psychosocial adjustment, activity restriction, prosthesis satisfaction, phantom limb pain, and stump discomfort. We interviewed each amputee for all of the 4 sections and scored separately which is mentioned in table no.1. General adjustment, social adjustment, and adjustment to constraints are the three psychosocial sub-scales that make up the first portion. Each sub-scale has five items that are scored on a 4-point scale (Strongly disagree; Disagree; Agree; Strongly agree). Scores vary from 4 to 20, and the higher the score, the more correction is required. The second component includes a 10-item activity restriction scale with a 3-point rating system (Yes, limited a lot; Limited a little; No, not limited at all). Scores vary from 10 to 30, with a higher score indicating a tighter limitation on activity. The third section, which is related to the prostheses' aesthetic and functional qualities, discusses user satisfaction with prosthetic use. Eight entries in this section each have a 3-point rating scale (Not satisfied; Satisfied; Very satisfied). The 4th and last sections investigate the experience of phantom limb pain, stump pain, and other medical conditions not linked to the amputation procedure.

Statistical analysis

Datas were analysed with SPSS version 16.0 for Windows. Mann Whitney U is used for the group comparisons. Statistical significance was set at $p < 0.05$.

RESULTS

The clinical characteristics of both groups are summarised in table no.1 In table no. 2 the Mann-Whitney test results are given for Barthel Index and TAPES-R questionnaire.

Most of the patients were using prosthesis 8-10 hours. The berthel index in terms of feeding, bladder & bowel issues shows that both male & female were capable to do their activity equally. When we compare the results in terms of (mobility, transfers, stair climbing,

prosthetic hygiene, bathing,) male group shows a higher score than female group. Males are more independent in doing their ADL activities comparing to females.

Table -1 Demographic data

Characteristics	**Participants (n = 90)**	
	Male (n = 48)	**Female (n = 42)**
Age (year)	39.8±7.3	39.0±8.9
Bodyweight (Kg.)	60.2±11.3	61.4±11.4
Marital Status Married Single Widowed / separated	 39 9	 37 3 2
Occupation Yes no	 42 6	 18 24

Table 2 Berthel scale

	PRS. HYG	**BATHING**	**FEEDING**	**TOILETTING**	**STR. CLMB.**	**DRESSING**	**BOWL& Bladder**	**MOBILITY**	**TRANSFERS**
Male	4.06±1.95	3.95±2.03	10±	7.39±3.38	8.12±3.16	9.16±2.12	10±	12.6±3.8	12.29±3.6
Female	3.8±2.12	3.92±2.05	10±	5.71±3.54	6.3±3.6	7.73±3.12	10±	11.7±4.5	10.71±4.3

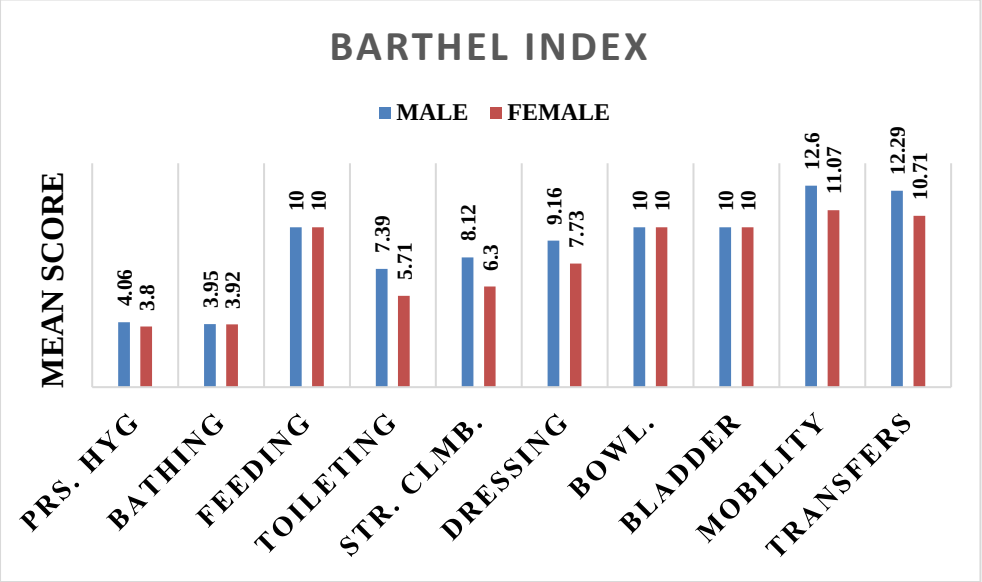


Figure 1.ADL Activities

Table 3.1 TAPES R scale

		male	female
Psychological adjustment	General adjustment	16.24	15.33
	Social adjustment	14.29	14.22
	Adjustment to limit	13.45	11.84

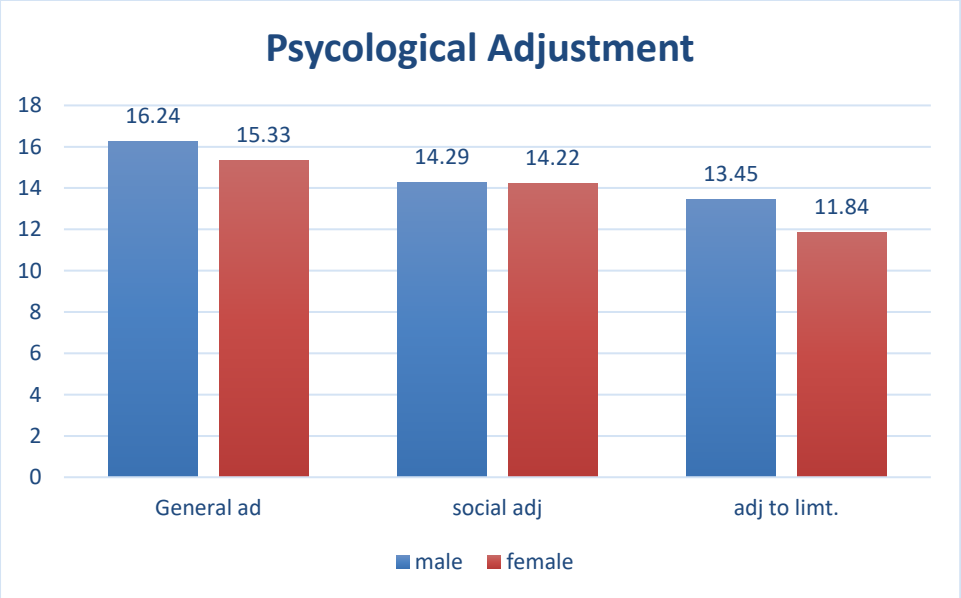


Figure 2. The results for Psychological adjustment scale shows that adjustment to limitation is most affected in female comparative to other two.

Table 3.2-Activity restriction

	vigorous	Several stunt	Running forward	sports	fight	Walk a mile	Half mile	100 meter	hobbies	work
Male	1.5	1.33	1.9	1.7	0.72	1.6	1.3	1.3	0.76	0.83
Female	1.8	1.03	1.4	1.2	0.51	1.3	1.12	0.8	0.52	0.67

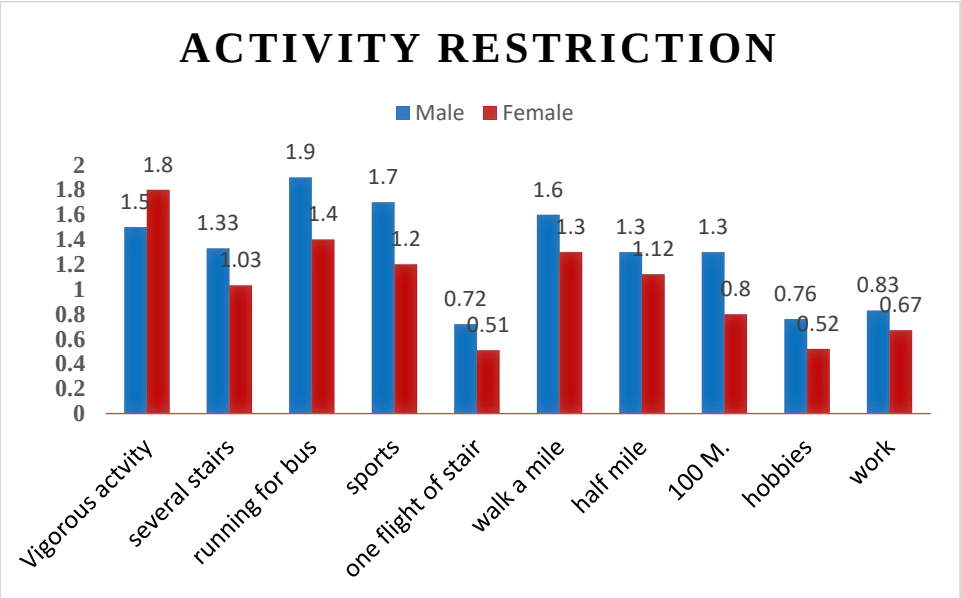


Figure 3. in Activity Restriction scale, female are superior in vigorous activity, and sports, running for bus are also majorly affected. The least affected activities are hobbies and walking for 100 meters, one flight of stairs etc.

Table 3.3 Satisfaction

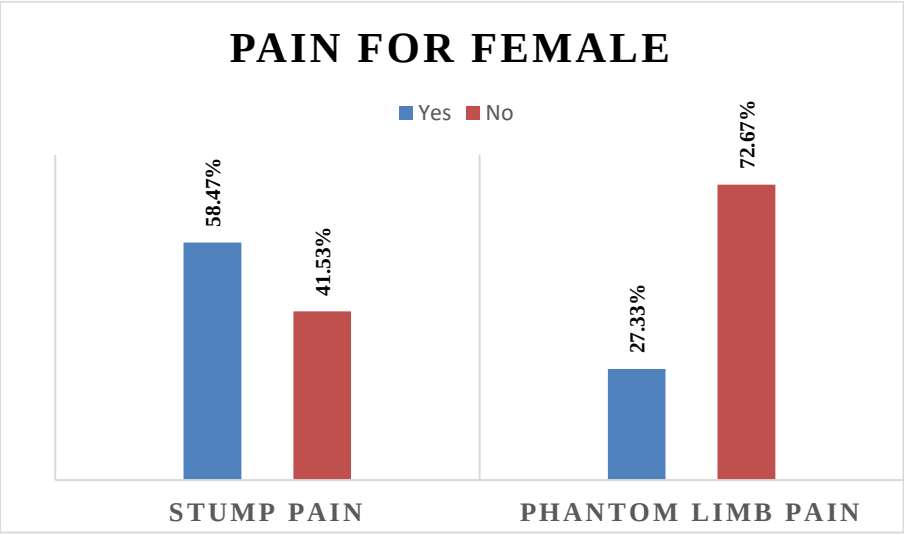
	colour	shape	appearance	weight	usefullness	reliability	fit	comfort
male	2.9	2.5	2.9	2.7	2.9	2.9	2.9	2.9
female	2.8	2.6	2.9	2.4	2.8	2.7	2.9	2.8

Figure 4. Satisfaction with prosthesis results both male and female are satisfied with prosthesis. only there is a difference in weight.

Table 3.4-Pain

Male	Stump pain	Phantom limb pain
yes	48.33%	24.58%
no	51.67%	75.42%

Female	Stump pain	Phantom limb pain
yes	58.47%	27.33%
no	41.53%	72.67%



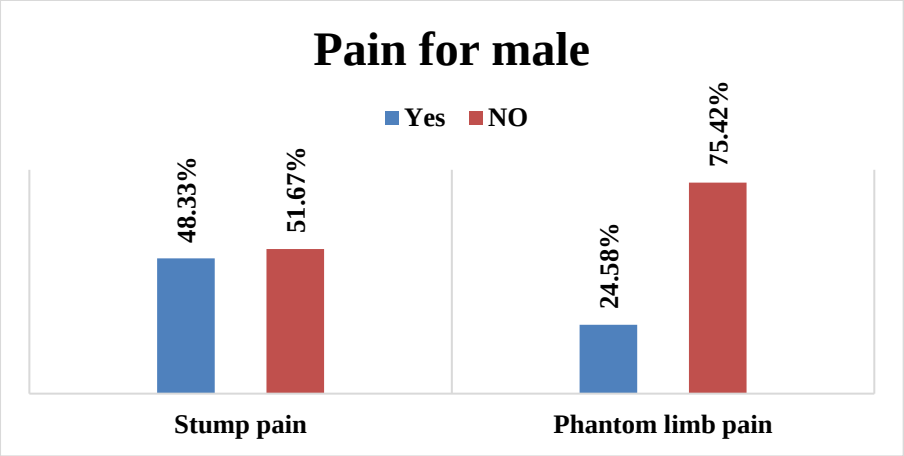


Figure 5. Female Experience stump pain and phantom limb pain is more comparative to male.

DISCUSSION

In this study, including both male & female with unilateral transtibial amputees were compared in two groups i.e., male and female groups (based on sex) with regard to their activity of daily living and quality of life. For comparison, the Barthel Index and TAPES-R questionnaire were taken as parameters.

Berthel index

Berthel index in terms of feeding, bladder & bowel issues shows that both male & female were capable to do their activity equally. When we compare the results in terms of (mobility, transfers, stair climbing, prosthetic hyegiene, bathing,) male group shows a higher score than female group. Males are more independent in doing their ADL activities comparing to females.

Psychological scale

The Psychological scale shows that comparative to social adjustment and general adjustment, adjustment to limitation is most affected. Limb loss affect a dramatic change of normal life. Adjustment is purely individualistic and also depends on some social factors. Some can adjust well and some cannot. [7,8]Female amputee think more about their body image. After amputation it is very difficult for them to get satisfaction in their life. Losing a limb has been found to dramatically change a person's sense of body image and consequently self-image, which has, in turn, been associated with a person's satisfaction with life[9].

Activity restriction

After prosthesis fitment all different abled person were almost independent in their ADL activities. Hobbies and walking for 100 meters were less restricted. Result shows for vigorous activity is most restricted activity for female. Syme ankle disarticulates and transtibial amputees do have the ability to achieve the same running biomechanics as able-bodied runners. After prosthesis fitment 15 person are doing job.in their views running for bus is the most restricted activity as it requires more energy consumption followed by sports, walk a mile, half mile,100meter race etc. After amputation most amputee do not have desire to run that's why they have less interest in recreational activities. [10]Almost all don't have any interest in sports.

Satisfaction

After using prosthesis all were satisfied. After fitment of prosthesis they were able to do their ADL Activities. Female respondent were little bit dissatisfied in shape though they are more serious about their body image. Both male and female have a negative respond towards weight of prosthesis. During fabrication it should be taken in to consideration to use lightweight materials to meet the daily activities smoothly. Prosthesis is the only hope to meet challenges after amputations. **[11,12]** Recent advances in prosthetic technology have overcome the problem of prosthesis weight. Literature suggests that light weight transtibial prosthesis has reduced the energy consumption but also indicated the deviations in the gait parameters of the amputees. **[13]** some literature says by using heavier prosthesis may result in better gait symmetry. **[14,15]** Literature and evidence base supporting on weight of transtibial prosthesis are still lacking. **[13]**

Stump pain and phantom limb pain

Female amputees experience more in stump pain and phantom limb pain comparative to male group. For most patients, both the phantom sensations and pain gradually resolve with time compared to stump pain. Stump pain will restrict more ADL activity. Amputee with phantom pain have a poor quality of life which is same as earlier study done by Lerner et al[17-19]. Phantom limb pain was prevalent among most amputees although few of them reported stump pain. The present finding was similar to those found in the literature by esfandiari et al.

The concluding suggestion is that rehabilitation programme can be done to improve perception of body image, self-esteem, sense of control, controlling stump pain and better prosthesis and its usage. And also, programme can be done to ensure both male and female can achieve same goal after use of prosthesis.

The male group have better experience in ADL than the female by using the Barthel index for ADL they have not focused on the difference in scoring based on sex on transtibial parameters that our study defines specifically.

Limitations of our study

The limitations of our study were that only 90 amputees out of a total of 200 possible participants agreed to participate in our study, but the number of participants was still higher than in other similar studies [12]. Another limitation was we took only sex as the independent parameter whereas other parameters like unilateral and bilateral groups and the cause of amputations could be taken and compared. The generalizability of this study is limited by the use of only one type of prosthesis that may or may not produce result similar to other trantibial prosthesis. Also, other scores like SF-36(Short Form Survey), NEADLS (Nottingham Extended Activity of Daily Living Scale), etc. could be taken, which we have taken as guidance for future studies.

The difference in practicing ADL and quality of life including personal hygiene and household tasks was the main inspiration for our study and also this difference is large in countries like India. We found those women's activities are restricted more which implies usually household chores and community activities. Men are mostly satisfied with their prostheses than women.

CONCLUSION

In summary, our preliminary results suggest that there is no significant difference between male and female amputees in terms of ADL, but men have a better quality of life in terms of satisfaction with the prosthesis and limitation of their activities. This means that women have more problems in performing household activities in everyday life. Since our study centre is located in the eastern part of India, most of the women are responsible for household chores, which cause them many problems. Our study also throws light on the bigger problems, namely special gait training, ADL training and more appropriate prosthetic material for women. Finally, we believe that future studies with a larger group of patients are needed to compare other scales and questionnaires to test ADL and quality of life.

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Conflict of Interest

The author(s) declared no conflict of interest.

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