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Functional Outcomes of Adolescents after initial Treatment of Upper limb Fractures in a selected district in Sri Lanka

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Abstract

Background:

Injuries are the number one cause of morbidity and mortality among adolescents. Prevention of adolescent related injuries is an investment for a country as adolescents belong to an economically productive age group.

In Sri Lanka, 59.5% of upper limb fracture victims admitted to the National Hospital was facing difficulties in performing their daily activities during the first three months after treatment.

Objectives:

To assess the functional outcomes of adolescents with upper limb fractures aged 10 to 19 years attending selected government hospitals in a selected district in Sri Lanka.

Methodology:

A follow up study was carried out for randomly selected 400 adolescent victims who had been diagnosed with upper limb fractures due to injuries. They were recruited from six major hospitals in the district of Colombo after initial treatment and followed up after six weeks. A validated and culturally adopted new instrument was used to assess their functional outcomes at six weeks while attending follow up clinics at their respective hospitals or at their residences.

Results:

Out of 400 victims, 33.2% had good functional outcomes after six weeks of treatment. Most of them were unable to perform special activities namely playing, sports or recreational activities or sewing (Mean score 865.5 with standard deviation of 23.97).

Conclusions and Recommendations:

The rehabilitation care of adolescent fracture victims has to be strengthened to have a speedy recovery as they are the future generation in a country.

Keywords: Adolescents, Upper limb fractures, functional outcomes

Introduction

It is evident that fractures are a common public health problem among children and adolescents all over the world [1]. According to the WHO report on child injury prevention, the overall fracture rate was 32.4% among children under 15 years of age. A hospital-based research which was carried out among children, including adolescents, in Canada revealed that 85% of major fractures occurred while playing in playgrounds which led to functional impairment and risk of nerve or vessel damage [2]. Fracture union is a gradual process while immobilization and surgery may facilitate healing through physiological process [3].

Functional outcome (FO) is defined as the "measurable goal that helps a patient to perform the specific activities of daily living" [4]. FO of limb fractures was assessed among children in India in 2016 [5]. It was identified that 80.7% of children's fractures were united at 3 to 6 months but complications like stiffness (13%), superficial wound infections (8.7%), delayed union (8.7%) and malunion (4.3%) had been noticed. Therefore, they needed special care due to complications of fractures. Lifelong deformities are accompanied by low productivity and reduced quality of life of adolescents.

Materials and methods

A follow up study was carried out in the district of Colombo in the Western province of Sri

Lanka. It was carried out in orthopedic clinics or surgical clinics in all secondary and tertiary care hospitals and at the residences of the study participants. The study participants were randomly selected adolescents who had been diagnosed with upper limb fractures by clinical specialists in respective wards. Informed written consent was obtained from eligible participants and their parents prior to data collection. Their contact details and information regarding clinic follow-ups were recorded.

The sample size was determined based on the minimum requirement to describe the clinic attendance for follow up care of adolescent fracture victims. The expected proportion of adolescent victims who had attended follow up clinics was taken as 50% with the pre-determined level of precision of 0.05 and 95% confidence interval. The calculated sample size was 384. A further adjustment to the sample size was made achieving a response rate of 80%. The maximum sample size was 480.

Four pre-intern medical officers were recruited and trained for the data collection. When adolescent victims did not follow the clinic visits as instructed by the staff, the data collectors visited their residences with prior consent to assess their daily activities.

A validated questionnaire called Functional Outcomes of Adolescents with Upper Limb Fractures (FOAULF) was developed by using two generic instruments [6]. The validation of the new instrument was carried out to appraise validity, reliability, and acceptability in a different setting. The FO was measured by a scoring system using a five-point Likert Scale. A score of zero indicates normal function and five indicates maximum disability. The total score obtained by each participant was calculated and a cut off value was decided statistically using percentile values and with the opinion of experts to categorize the level of FO. Functional outcomes of adolescents were categorized into three levels namely “good”, “satisfactory” and “poor” FO. Bi variate analysis was performed with a probability (P value) value of less than 0.05 as the level statistically significant. Ethical clearance was obtained from the Ethics Review committee, Faculty of Medicine, University of Colombo, Sri Lanka.

Results:

Four hundred participants were followed up at six weeks with a response rate of 88.9%. The reason for non-response was, 10 (2.2%) participants had not given the consent to participate, and 40 (8.9%) participants were unable to trace at clinics or at their residences.

Assessing FO of adolescent victims at six weeks after initial treatment

Majority of them were followed at their residences (n=245; 61.3%) and 38.7% (n= 155) were followed at their respective clinics. The reason for not attending clinics at six weeks was that most of them had attended clinics before completing six weeks.

The mean scores obtained by adolescent victims using the FOAULF instrument.

The mean score and standard deviation were calculated for each item.

Table 3.1 describes the mean score of selected items rated by adolescent victims.

The highest mean score rated by adolescent victims was for performing special activities such as playing, doing sports, or playing musical instruments (Mean 865.5, SD=23.97). Mean score rated for pain and associated subscale by adolescent victims was 290.0 (SD=86.91).

Table 3.1: The mean scores of selected items rated by adolescent victim.

| Item | Mean score | SD | 95% CI: (%) |
|-------------------------------|------------|-------|-----------------|
| Pain and associated problems | 290.00 | 86.91 | 233.2% - 370.7% |
| Perform activities by fingers | 283.00 | 15.55 | 272.0% - 294.0% |
| Daily activities | 284.33 | 30.06 | 258.6% - 319.0% |
| Perform special activities | 865.5 | 23.97 | 842.2% - 880.5% |

The distribution of study participants by their cutoff values

The study participants were categorized into three groups according to percentile values as described earlier. The cut of values was set at 67 (33rd percentile) and 78 (66th percentile) to categorize them into three groups with the opinion of experts.

Table 3.2 depicts the cut off values for three levels of FO. Only 33.2% (n=133) of adolescent victims had good FO and followed by 33% (n= 132) of the participants who had satisfactory FO.

Table 3.2: The frequency distribution of study participants by their level of FO.

| Category | Number | Percentage (%) |
|-----------------|------------|----------------|
| Good FO | 133 | 33.2 |
| Satisfactory FO | 132 | 33.0 |
| Poor FO | 135 | 33.8 |
| Total | 400 | 100.0 |

Association between selected Sociodemographic factors of adolescent victims with their FO:

Table 3.3 depicts the association of selected sociodemographic factors and their FO.

A higher proportion of female participants had satisfactory FO compared to other categories (n=26; 36.6%) and there was a statistically significant association between sex of the participant and FO (p<0.001). A higher proportion of participants with ages 16 to 19 years had satisfactory FO compared to other categories (n=23; 40.4%) but there was no statistically significant association (p=0.29). A higher proportion of participants who were not schooling had satisfactory FO (n=10; 38.5%) and there was statistically significant association (p<0.001).

Table 3.3: Association between selected sociodemographic factors of adolescent victims and FO.

| Sex | Functional outcome | | | | Total | Chi square value | |
|-------------|--------------------|------|--------------|------|-------|------------------|-----------------|
| | Good | | Satisfactory | | | | Poor |
| | No | % | No | % | No | % | |
| Male | 113 | 34.4 | 106 | 32.2 | 110 | 33.4 | $\chi^2 = 10.8$ |

| | | | | | | | | | |
|---------------------------|-----|------|-----|------|-----|------|-----|------|-------------------|
| | | | | | | | | | df=6 |
| Female | 20 | 28.2 | 26 | 36.6 | 25 | 35.2 | 71 | 17.7 | p<0.001 |
| Age | | | | | | | | | |
| 10-13 | 91 | 33.3 | 83 | 30.4 | 99 | 36.3 | 273 | 68.3 | $\chi^2=4.48$ |
| 14-15 | 21 | 30.0 | 25 | 35.7 | 24 | 34.3 | 70 | 17.5 | df=4 |
| 16-19 | 21 | 36.8 | 23 | 40.4 | 13 | 22.8 | 57 | 14.2 | p=0.29 |
| Level of education | | | | | | | | | |
| Schooling | 124 | 33.2 | 122 | 32.6 | 128 | 34.2 | 374 | 91.0 | $\chi^2=11.04$ |
| Non-Schooling | 09 | 34.6 | 10 | 38.5 | 07 | 26.9 | 26 | 9.0 | df=6 |
| | | | | | | | | | p<0.001 |

Association between selected injury related information of the study participants with their FO

A higher proportion of participants who sustained fractures at sports or play area had poor FO compared to other categories (n=16: 40.0%) and there was statistically

significant association between the place of injury and the FO (p<0.001).

The association between FO of the study participants and injury related information is summarized in Table 3.4.

Table 3.4: Association between selected injury related information of the participants with FO.

| Place of injury | Functional outcome | | | | | | | | Chi square Value |
|-------------------------------|--------------------|------|--------------|------|------------|------|------------|--------------|-------------------------|
| | Good | | Satisfactory | | Poor | | Total | | |
| | No | % | No | % | No | % | No | % | |
| Home | 61 | 33.2 | 64 | 34.8 | 59 | 32.0 | 184 | 46.0 | $\chi^2=12.76$ df=12 |
| Educational | 43 | 31.2 | 46 | 33.3 | 49 | 35.5 | 138 | 34.5 | |
| Street or paths | 15 | 39.5 | 12 | 31.6 | 11 | 28.9 | 38 | 9.5 | P<0.001 |
| Sports & play area | 14 | 35.0 | 10 | 25.0 | 16 | 40.0 | 40 | 10.0 | |
| Total | 133 | | 132 | | 135 | | 400 | 100.0 | |

Discussion

Out of 400 participants, 66% had good and satisfactory FO. The higher the score the less positive would be the functional outcome of a patient [7]. In comparison, previous literature had not assessed the level of FO based on cut off values, although there were several studies that had utilized generic instruments using different methodologies.

Future research findings are needed to focus on those belonged with poor FO (33%) to assess their severity and to improve further management of upper limb fractures. Majority of the participants had rated their difficulty in performing special activities even after six weeks.

The present study will guide researchers to assess the association between the functional outcomes of adolescent victims with sociodemographic factors as well as with injury related information in the absence of previous research.

Conclusion:

Moreover, increased attention has to be paid to follow up care while treating adolescents with upper limb fractures. Therefore, rehabilitation care for victims with upper limb fractures must be strengthened.

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