Original Article

Economic Benefit in Treatment of Unintentional Childhood Injuries by Implementation of Child-To-Child Approach

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Abstract

Background: Childhood injury has been recognized as a major threat to child survival and health, as well as economic burden, which includes the cost to government and out-of-pocket expenses (OOPE) to families. Child-To-Child Approach is an innovative technique to reduce childhood injuries and expenses on their treatment. **Objectives:** To assess economic benefit in the treatment of unintentional childhood injuries, including OOPE by families, by the implementation of the child-To-Child approach. **Materials and Methods:** The present study is part of a quasi-experimental before-and-after intervention study conducted in the rural area of Delhi for the prevention of childhood injuries through intervention by the child-To-Child approach. Cost of injury treatment, including travel and accommodation expenses, and wage loss were noted. The projected gain in the total cost and out-of-pocket expenditure on injury treatment throughout 20 years of childhood and adolescence were calculated. **Results:** Both incidences of injuries and total expenditure for treatment of injuries had decreased during the postintervention period in the intervention group, against a rise in the control group. The proportion of OOPE for availing private health care facilities for treatment of injuries, which was more than one-fourth of total expenses, also had decreased in the intervention group during the postintervention period. On economic analysis, it is projected that there will be enormous gain in cost by the implementation of child-To-Child approach in the study area in 20 years, along with saving of OOPE of the families. **Conclusion:** Child-To-Child approach is effective in preventing childhood injuries and reducing the cost of treatment of injuries.

Keywords: Child-To-Child approach, economic benefit, out-of-pocket expenses, unintentional childhood injuries

Introduction

Child injury has been recognized as a major threat to child survival and health. According to Global Burden of Diseases data, 18% of the 3.5 million deaths among children aged 1–19 years occur due to unintentional injuries.[1] Many more children suffer from consequences of nonfatal injuries and subsequent life-long disabilities, leading to high loss of disability-adjusted life years (DALYs).[2] Researchers have also reported high cost incurred by families for the treatment of injuries in children,[3-7] which includes the cost to the government and out-of-pocket expenses (OOPE) to the families. Universal health coverage focuses on reducing financial hardship to families due to out-of-pocket expenditure. Hence, evidence-based solutions need to be worked out for the same.

Innovative techniques have been implemented to reduce childhood injuries, one such being the Child-To-Child Approach.[8] The present study reports the economic burden on families and government due to childhood injuries and the gain in cost for treatment of injuries by implementing the Child-To-Child Approach.

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Materials and Methods

A quasi-experimental before-and-after intervention study was conducted in rural Delhi, for testing the efficiency of Child-To-Child Approach. Ethical clearance was taken from Institutional Ethics Committee and the trial was registered under the Clinical Trial Registry – India.

The study area comprised two villages, as intervention and control areas. The study population included 397 children

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and adolescents, 197 in intervention village and 200 in control village. Sample size was calculated based on a pilot study conducted in the area before conceptualizing the main study, on 50 children 0–19 years of age, with a recall period of 3 months, where the incidence of injury was calculated as 15%. The sample size was calculated assuming after intervention the incidence would come down by 5%, keeping alpha and beta errors at 5% and 20%, respectively.[9] With a design effect of 2 as >1 child were to be included from each family, and a dropout rate of 10%, a final sample size of 200 subjects in each group was decided. Families having at least one adolescent and two younger members were included in the study. Recruitment of eligible families was made till the required sample size was reached.

The eldest literate adolescents of the families included in the study were trained on first aid, cardiopulmonary resuscitation, road safety, traffic rules, common types of injuries, their prevention and immediate management. The adolescents were each given a module, a first aid kit and a box with child-safety lock, and were told to remain vigilant to reduce injuries in themselves and their younger siblings.

Data regarding the occurrence of injuries was collected during pre- and post-intervention phases of 4 months each, in the same months of the year, and were compared in terms of the magnitude of injuries and cost incurred for treatment of injuries including travel expenses. Each family was visited once a week during the data collection periods and details regarding injuries that occurred in the previous week were enquired into. One injury event was considered as one child injured at one point of time, even if it resulted in multiple injuries.

Cost of treatment was noted on all aspects that is doctor's consultation fee, medicines, investigations, operations, bed charges, etc. In addition, expenses for travel to and from the health facility, expenses for person staying with the patient in case of admitted subjects, and wage loss of accompanying person were noted. For calculating private cost, information was taken about the amount actually paid for availing the services. For government cost, the cost of medicines taken, investigations done and procedures undergone were calculated from Rate Contract of Delhi Government Central Procurement Agency for medicines and the amount prescribed for reimbursement for investigations and procedures under Delhi Government Employees' Health Scheme.

Analysis was done for all injuries that occurred in both the groups during the pre- and post-intervention periods. Choice of health facility for taking treatment and cost incurred on treatment were calculated. Comparisons were made within and between groups. Projected gain in cost was calculated for the intervention area, considering the occurrence of injuries in the preintervention period and their subsequent reduction in the postintervention period following implementation of the Child-To-Child approach.

Results

During the preintervention period, 25 and 26 injury events had occurred in the intervention and control groups respectively. These figures had changed to 16 and 29 injury events during the postintervention period, indicating a decrease in the intervention group against a corresponding rise in the control group.

Table 1 shows the place of treatment visited for injuries. In the control group, similar pattern was observed in both phases that is more subjects had availed treatment from unqualified locally Registered Medical Practitioners (RMP), bought medicines from pharmacies over-the-counter without prescription or were given symptomatic treatment with medicines from the health center by field investigators (FI) of the project on request. However, in the intervention group, less than one-fourth of the subjects availed treatment from government institution in the preintervention phase, which increased to more than two-third of the subjects in postintervention phase. The difference between pre- and post-intervention data in the intervention group was significant as well as significant in comparison to post-intervention data of control group.

Table 2 was constructed excluding the injured subjects who had not taken any treatment. Hence cost of Rs. 0 was eliminated. Both total and mean expenditure incurred on treatment for injuries had decreased during postintervention period in intervention group, against a rise in control group. The median cost had also decreased in postintervention period in intervention group. However, none of the differences were statistically significant. Proportion of OOPE for availing private health care facilities out of total expenses incurred had decreased in the intervention group during post intervention period against a corresponding rise in control group.

Table 3 depicts the projected gain in cost by the implementation of intervention. Operational definitions of various costs have been represented in Figure 1. Mean cost saved per injury by the implementation of Child-To-Child Approach in intervention group was seen to be Rs. 95.96 in the study, which is the difference between the mean cost of injury treatment in intervention group during pre- and post-intervention periods. In absence of intervention, expected number of injury events per year in the study population to which the intervention group belonged should be similar to injury occurrence in preintervention phase i.e. 25 injuries in 4 months or 75 injuries per year. Therefore, cost saved per child in the study area works out to be Rs. 36.53 per year amounting to Rs. 730.66 in 20 years. Funding support for intervention was Rs. 75,000.00 for 197 children, amounting to Rs. 380.71 per child. Considering this as the expense incurred, the total cost gained in 20 years for treating injuries per child is Rs. 349.95. Census 2011 shows the population of the intervention village as 8949.[10] Considering children in 0–19 years to be 45% of the total population as per Census of India,[11] there are expected 4027 children in this age group in the intervention village. Hence through the implementation of the Child-To-Child

Table 1: Comparison of place of treatment of injury events in different phases

Place of treatment	Study population			
	Intervention group		Control group	
	Preintervention (*n*=25), *n* (%)	Postintervention (*n*=16), *n* (%)	Preintervention (*n*=26), *n* (%)	Postintervention (*n*=29)
Home/none	10 (40.0)	0	10 (38.5)	10 (34.5)
RMP/OTC/FI	9 (36.0)	5 (31.2)	14 (53.8)	15 (51.7)
IPD/OPD	6 (24.0)	11 (68.8)	2 (7.7)	4 (13.8)

Comparison

Groups	*P**
Preintervention data of intervention and control groups	0.216
Pre- and post-intervention data of intervention group	0.004
Postintervention data of intervention and control groups	0.000

*Independent samples Chi-square test. RMP: Registered medical practitioner, OTC: Over-the-counter, FI: Field investigator, IPD: In-patient department, OPD: Out-patient department

Table 2: Cost (Rs.) of treatment for injury events in subjects who took treatment in different phases

Cost of treatment (Rs.)	Study population				
	Preintervention		Postintervention		Total
	Intervention group	Control group	Intervention group	Control group	
Private cost					
n	9	14	5	7	35
Mean	175.55	180.14	111.00	881.78	309.41
Median	100.00	56.00	110.00	180.00	85.00
SD	311.92	280.39	39.75	1472.13	721.42
Total private cost (percentage of total cost)	1580.00 (26.50)	2522.00 (53.27)	555.00 (11.21)	6172.50 (88.01)	10,829.50 (48.08)
Government cost					
n	5	4	11	12	32
Mean	876.59	553.12	399.49	70.07	381.63
Median	12.50	27.70	14.94	12.5	12.50
SD	1734.07	1061.09	1186.46	139.49	1033.79
Total government cost (percentage of total cost)	4382.93 (73.50)	2212.50 (46.73)	4394.36 (88.79)	840.88 (11.99)	11,830.67 (52.21)
Total cost					
n	14	18	16	19	67
Mean	425.92	263.03	329.96	369.12	343.33
Median	90.00	46.44	19.78	40.00	44.98
SD	1051.96	533.17	1009.50	946.63	875.68
Total cost	5962.93	4734.50	4949.36	7013.38	22,660.17

Comparison

Groups	*P*	
	Median test	MannWhitney U-test
Preintervention phase of intervention and control groups	0.285	1.00
Pre- and post-intervention phase of intervention group	0.466	0.847
Postintervention phase of intervention and control groups	1.000	0.973

SD: Standard deviation

Approach, projected cost gained on treatment for injuries in this target population of 4027 children in 20 years is Rs. 14,09,248.65, amounting to Rs. 70,462.43 per year.

However, if the program is implemented by the government as an ongoing program through health facilities or schools, there will not be any additional cost for intervention as was incurred in the present research. In such case the gain in cost per child in 20 years will be the entire cost saved by intervention, that is Rs. 730.66, amounting to Rs. 29,42,367.82 for the target population.

Of the total cost on treatment, 26.5% was the cost of attending private facilities that is OOPE for the families of the intervention group which reduced to 11.21% in the postintervention phase,

Table 3: Projected gain in cost by Child-To-Child Approach

Cost for intervention group	Total cost (Rs.)
Mean cost saved on treatment of injury following intervention (A)	95.96
Cost saved on treatment of 75 injuries in study subjects/year	7197.00
Total number of study subjects in intervention group	197
Expected cost saved on treatment/study subject/year (B)	36.53
Expected cost saved on treatment/study subject in 20 years (0-19 years of age)	730.66
Total amount spent on intervention	75,000.00
Cost of intervention per study subject	380.71
Expected cost gained by intervention/study subject/year (C)	17.50
Expected cost gained by intervention/study subject in 20 years	349.95
Projected gain in cost for 4027 children in 20 years (0-19 population as per census)	1,409,248.65
Projected gain in cost for 4027 children per year (D)	70,462.43
Projected gain in cost without incurring intervention expenses, for 4027 children in 20 years	2,942,367.82
Projected gain in cost without incurring training expenses, for 4027 children per year (E)	147,118.39
OOPE	
Projected gain in OOPE, for 4027 children in 20 years (15.29% of total expenses without intervention expenses)	449,888.04
Projected gain in OOPE, for 4027 children per year (F)	22,494.40

OOPE: Out of pocket expenditure

thus reducing by 15.29% of total expenses as a result of the intervention. As the families did not have to bear any expense toward training cost the projected gain in OOPE will be 15.29% of the total gain in cost amounting to Rs. 4,49,888.04 in 20 years, that is Rs. 22,494.40/year [Table 3].

Discussion

Injuries constitute a large proportion of the global burden of childhood death.[12] Many more children suffer from the consequences of nonfatal injuries and subsequent life-long disabilities, leading to high loss of DALYs.[2,13] Millions of people suffer injuries that are treated at various levels of health facilities or undergo treatment that does not involve formal medical care.[14] Expenditure toward treatment of childhood unintentional injuries has been reported by researchers in India and abroad to be very high and out-of-pocket expenditure accounts for a considerable portion of this.[3-7]

The WHO has declared Universal Health Coverage as the need of the hour.[15] India, with its Ayushman Bharat Scheme, also gives priority to reduce OOPE to a minimum so as to prevent impoverishment in any family for availing healthcare.[16] Hence, the greatest need of the hour is to implement context-specific preventive measures to combat this enormous problem. One such measure is the Child-To-Child Approach,[8] which was tested in this study for its ability to reduce incidence of unintentional childhood injuries as well as cost of their treatment to the government and families.

Families resort to different types of treatment for childhood injuries. As reported by various authors, in 24%–68% of cases treatment was sought from trained health personnel, which included doctor from mobile clinic, government health facility, private health facility, health worker, Anganwadi worker, or private practitioners belonging to either system of medicine.[3,4,17,18]

Home remedy by a family member still comprises major portion of care after injuries in our country, with two studies reporting 29% and 53% of all cases resorting to home remedy.[3,17] In the present study, majority of the families took treatment from unqualified RMPs. Use of home remedies was also quite common. However, during postintervention period in intervention area, significantly more subjects had availed treatment from government health institutions, thus indicating the improved choice of facility for treatment by the families under study in the intervention group.

Expenditure toward treatment of childhood unintentional injuries has been reported by researchers in India and abroad to be very high.[3-7] A review conducted by Lao *et al*. to study the economic costs of childhood injuries that included studies from low, middle, and high income countries reported cost of childhood unintentional injuries to be enormous, ranging from US $516,938 to US $9,550,704 per year. One of the studies reported that the direct costs paid by victims accounted for 76.14% of the total costs for health care.[5]

In India, Chalageri *et al*. in their study calculated direct cost which included medical cost (hospital charges, drugs, dressing, rehabilitation devices, etc.,) and nonmedical cost (travel, legal costs, funeral, loan taken, property sold). The average indirect cost per injury, which was calculated by wages lost by caregiver, was found to be Rs. 497. Overall, the total average cost per injury, including both direct and indirect cost, was seen to be Rs. 2601. The range of cost per injury reported in the study was Rs. 100–18,650.[4] In an urban resettlement area in New Delhi, a family had to spend Rs. 3759 on an average for treatment. In case of a road traffic injury the expenses ranged from Rs. 200–15,000. Overall, the expenses incurred by the family to treat an injured child were on an average Rs. 1408, ranging from Rs. 100–15,000.[3]

In the present study at the baseline, i.e. during the preintervention phase, significantly more proportion of injured subjects had

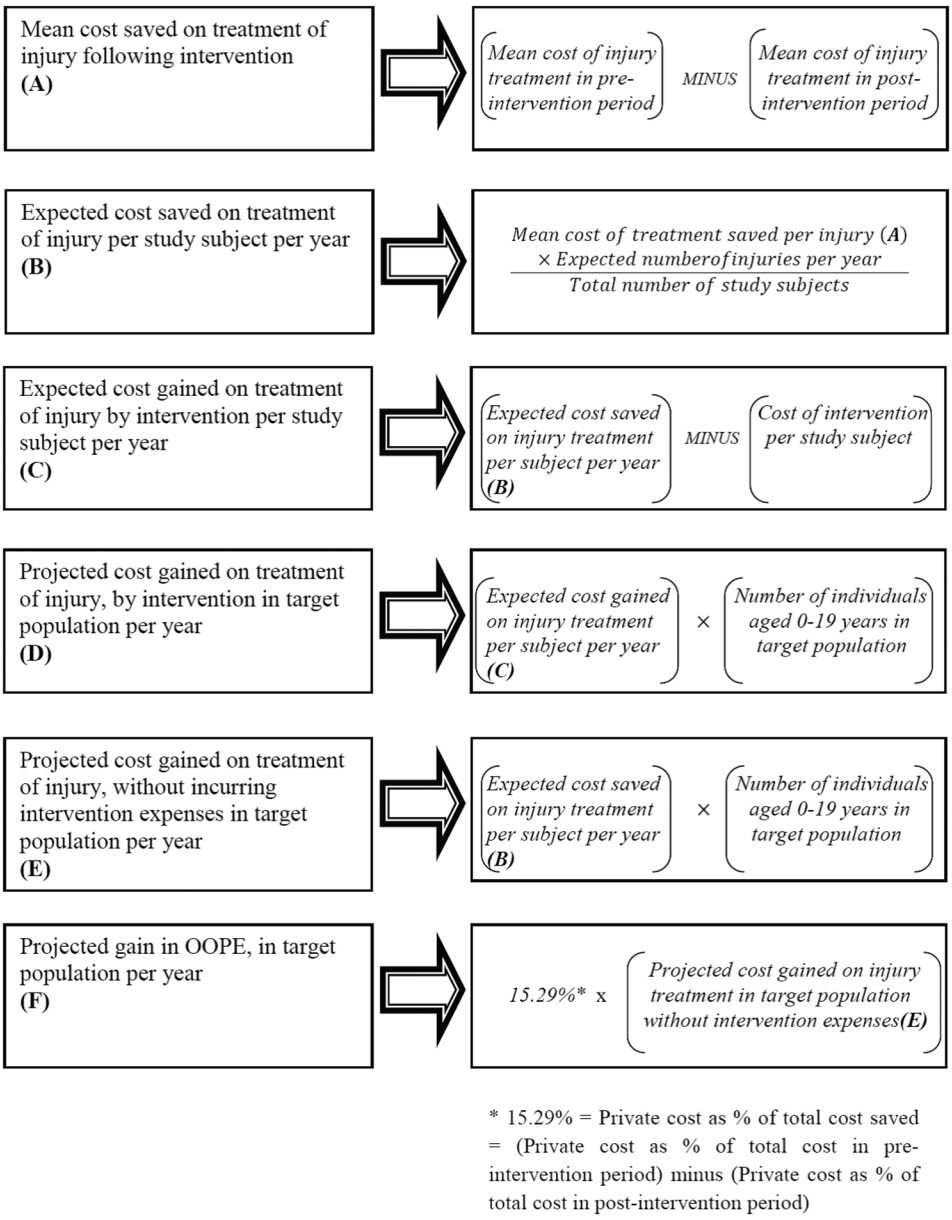

Figure 1: Operational definitions related to cost of injury treatment. *15.29% = Private cost as % of total cost saved = (Private cost as % of total cost in preintervention period) minus (Private cost as % of total cost in post-intervention period)

availed private health facilities in both the groups. The mean cost was Rs. 334.33 in the total population, Rs. 425.92 in the intervention group and Rs. 263.03 in the control group. Proportion OOPE for availing private health care facilities out of total expenses in the total study subjects was 48% of the total expenses incurred on treatment for injuries. This private expenditure incurred was mainly for treatment from local unqualified RMP. Major portion of the cost incurred was the direct cost for treatment and a small portion was travel cost. No loss of wage was reported by any family.

Previous studies on the estimated gain in the cost of injury treatment by any kind of intervention could not be found. In the present study, projected gain in the cost of treatment of injuries was calculated on the basis of study findings. On economic analysis, it is projected that there will be enormous gain in cost by the implementation of Child-To-Child Approach in the study area in 20 years, along with saving OOPE of the families. Intervention in the present research was conducted with special effort and by incurring private cost. Child-To-Child Approach implemented by the government as a regular ongoing program in schools and colleges as well as through health facilities will bring down cost of training to a considerable extent, thus increasing the efficiency of the approach even further. Implementation of this program will thus reduce unintentional injuries in children and ease the financial burden on the families along with saving of government funds.

The strength of our study is that it estimates the projected cost gained in the treatment of unintentional childhood injuries by implementing the Child-To-Child approach. To the best of our knowledge, such analysis has not been done in this context. However, our study estimates cost saved and projected cost gained assuming a single training episode. Further research is required to estimate whether a single training event would suffice or re-trainings are required for successful injury prevention over a lifetime.

Conclusion

Implementation of Child-To-Child approach in unintentional childhood injury prevention efforts resulted in a decrease in the cost of treatment of childhood injuries in the study population and showed a projected reduction in out-of-pocket expenditure by the families on treatment. Implementation of the program at the government level can bring down its cost and result in further decrease of out-of-pocket expenditure and ease financial burden on families.

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Conflicts of interest

There are no conflicts of interest.

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