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Pain evaluation response during COVID-19 lockdown on school going children: A cross sectional study

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Abstract
COVID 19 pandemic and lockdown as a measure to contain it has a severe psychological impact on children affecting their social, behavioral, emotional and somatic aspects. This study was undertaken in the cities of Raipur and Kolkata from 15th April to 31st May on urban school going children aged 5-15 years. A questionnaire comprising of four categories with 5 questions each of social, behavioral, emotional and somatic response was handed over to be answered. Each YES answer scored one point. The total points scored were compared between each category. Comments about corona virus and lockdown were also noted. Pain was inflicted by inflating BP cuff and holding till pain was perceived which was plotted on VAS scale. Significant impact on emotional and behavioral aspect of urban children was noted whereas pain response in term of Visual Analogue Scale (VAS) score was found to be non-significant. Lockdown and the resulting confinement has significant effects on emotional and behavioral response of urban school going children. This study was aimed at evaluation of these psychosomatic factors in term of Pain Evaluation Response (PER) by correlating them with pain response.

Keywords: Emotional changes, pain evaluation response, visual analogue scale, COVID-19, lockdown

Introduction
Lockdown as per Oxford dictionary is "A state of isolation or restricted access instituted as a security measure". The pandemic of COVID-19 disease has forced government of over 200 countries to impose lockdown on their residents to break the chain of transmission [1], making them stay home and to go out for essential work only. The fear of transmission of virus by droplet has made people wear mask, avoid gathering and spend more time on washing and sanitization. Children being the most dependent members of family are strictly being home bound, their out world in form of school and playground are now absent from their life since last three months. Along with adults, children are going through psychological turmoil in their life [2, 3]. School closures, although an important measure to limit the spread of COVID-19, has resulted in increased social isolation for children.
Practicing social distancing or even being self-isolated, will reduce the choice and autonomy children and young people have over their lives. They may find themselves unable to take part in important recreational activities that improve their well-being like sports, arts, music or games. Children may also struggle because of increased amounts of free time, but with few activities to fill it. COVID-19 has likely affected children's mental health [4]. Concern and worry about the virus will likely impact those living with anxiety and depression. Small children may need constant supervision or help in the effort of high personal hygiene in response to pandemic. Studies have suggested that public health emergencies can have many psychological effects, which may be expressed as anxiety, fear, and worry, among others [5]. Thus this study was aimed at to evaluate psychological impact on school going children in India in the present scenario of lockdown due to Covid-19 pandemic.

Methods
This was a cross sectional observational study. The study was conducted in the cities of Raipur, Chhattisgarh and Kolkata, West Bengal from 15th April to 31st May among 221 school going children aged between 5 and 15 years living in nuclear families. Children suffering from any disease including infectious diseases like tuberculosis, systemic illnesses such as sickle cell disease, rheumatoid arthritis, psychiatric disorders or any congenital anomalies were excluded from the study.

A questionnaire comprising of four set of questions i.e. social, behavioral, emotional and somatic response, with 5 questions in each set were handed over to them to answer independently in form of YES or NO. The mark of YES was assigned as 1 and that of NO was assigned as 0. The answer scored one point which was summed up in each set of questions.

The points scored were then compared between each set to find for differences, if any. Answers about corona virus and lockdown were also included in the questionnaire. Pain threshold was noted by inflating blood pressure cuff and holding till pain is complained. Pain perceived was plotted on VAS scale.

The primary objective of our study was determination of Pain Evaluation Response (PER). PER is a cumulative response generated by social, emotional, somatic/pain symptom or behavioral factors which mimics typical physical pain. VAS (Visual Analogue Scale) scoring and correlation of PER Score with VAS was the secondary outcome of the study.

After approval from the Institutional Ethics Committee, this study was undertaken at in Raipur (Chhattisgarh) and Kolkata (West Bengal) to study the Pain Evaluation Response (PER) on 221 children during COVID-19 lockdown using convenient sampling methods. A written and informed consent was taken from the parents of all the children. Children in the age group of 5-15 year sliving in our societies were included in the study and divided into 2 groups. Group I comprised of children of 5-10 years and Group II had children of 11-15 years who were requested to fill a self-designed semi structured questionnaire comprising of 20questions. These questions were grouped into four categories, namely Social factors, Emotional factors, Pain or Somatic factors and Behavioral factors.

Table 1: Questionnaire

S. No.	Social Factors	Emotional Factors	Somatic/Pain Symptoms	Behavioral Factors
1.	I feel lonely	I feel sad	I feel energetic	I am more quiet & sleep well
2	I do not enjoy things as much as I used to	I feel like crying	I have headaches when worried	I get annoyed/ angry easily (short tempered)
3.	I am worried, others do not want to be with me	I often have bad dreams of corona	I have stomach aches when worried	I feel like running away
4.	I am worried I have to wear a mask	I feel horrified about what is going to happen	I feel dizzy /shaky/jerky when worried	I have become stubborn
5.	I am scared of going outside	I am worry about being left alone	My heart beats faster on thinking too much	I spend >1 hour-cleaning, hygiene activities

Each category had five questions which best represent the category itself and which had to be answered in YES or NO. The response 'YES' was scored as 1 and 'NO' as 0. The score in each category varied from 0-5. This score depicted severity of changes in the respective group as mild (1-2), moderate (3-4) and severe (5). Ratings are summed up to make a simple sum score (which can vary between 0 and 20 points). The score was termed as Pain Evaluation Response (PER).The severity of PER was scaled as 0-5-No pain, 6-10 -Mild pain, 7-15 Moderate pain and 16-20 Severe Pain.

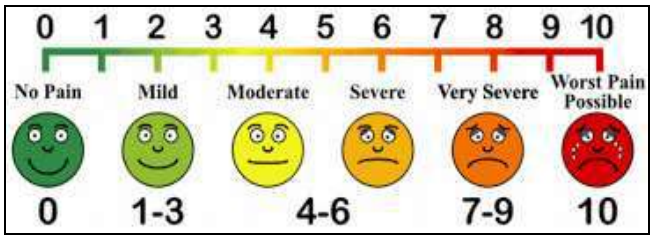

Fig 1: Visual Analogue Scale

To assess the severity of pain the blood pressure of each child was taken using appropriate size blood pressure cuff. Then the cuff was gradually inflated with a cuff inflation rate of 1 kPa/sec [6]. On further inflation of cuff, pressure was perceived as painful and when the child requested termination of cuff inflation, corresponding VAS was recorded subjectively. The child was shown the 10 cm Visual Analogue Scale (VAS) scale and asked to point the level of pain intensity [6]. (figure1) Termination of the cuff might be due to pain or discomfort or sensation of ants running up and down the skin or tingling sensation. To negate the potential bias of subjective measurement of VAS, will be correlated with PER score. It is very unlikely that the behavioral and emotional changes of the child (increased PER score) will not manifest as physical pain symptoms (decreased VAS score).This correlation of VAS and PER scores will be expressed analytically as strong, medium and poor.

The patients were selected randomly using convenient sampling methods. The random numbers were used from Kevin Conroy: 5120 Random Numbers (<5k, 2002) [Call the JavaScript pseudo-random number generator.] Website: RandomNumber.org, 2004.

Statistical Analysis was performed with help of Epi Info (TM) 7.2.2.2 EPI INFO is a trademark of the Centers for Disease Control and Prevention (CDC).

Descriptive statistical analysis was performed to calculate the means with corresponding standard deviations (S.D.). Test of proportion was used to find the Standard Normal Deviate (Z) to compare the difference proportions and Chi-square (χ^2) test was performed to find the associations. Also One Way Analysis of variance (ANOVA) and Two Way ANOVA followed by post hoc Tukey's Test were performed with the help of Critical Difference (CD) at 5% and 1% level of significance to compare the mean values of more than two groups. $p<0.05$ was taken to be statistically significant.

Results

This is a cross sectional survey. Responses of children to a semi structured self-designed questionnaire were recorded in four categories. (Table No. 2).

Table 2: Distribution of children according to their answers in various changes (n=221)

Variables	Severity of changes	Score	Number of respondents	%	Z-value	p-value
Social	No change	0	39	17.6	5.82	<0.001 S
	Mild	1	65	29.4		
		2	62	28.1		
	Moderate	3	32	14.4		
		4	22	10.0		
	Severe	5	1	0.5		
Emotional	No change	0	55	24.9	4.73	<0.001 S
	Mild	1	69	31.2		
		2	59	26.7		
	Moderate	3	28	12.6		
		4	9	4.1		
	Severe	5	1	0.5		
Pain/Somatic Symptoms	No change	0	29	13.1	8.43	<0.001 S
	Mild	1	105	47.5		
		2	55	24.9		
	Moderate	3	24	10.9		
		4	8	3.6		
Behavior	No change	0	27	12.2	5.64	<0.001 S
	Mild	1	62	28.1		
		2	68	30.8		
	Moderate	3	44	19.9		
		4	13	5.9		
	Severe	5	7	3.1		
VAS Scoring	No Pain		10	4.5	12.72	<0.001 S
	Mild		165	74.6		
	Moderate		45	20.4		
	Severe		1	0.5		

S-Statistically Significant

Test of proportion showed that in all the categories i.e. social, emotional, pain/somatic symptoms and behavioral, most of the children were having mild changes which was significantly higher (p<0.001).

Also as per VAS scoring system mild pain (74.6%) followed by moderate pain (20.4%) was significantly prevalent in higher proportion among the children under study (p<0.001).

The mean (mean±S.D.) scores of the children for social, emotional, pain/somatic symptoms and behavioral changes were 1.71±0.44, 1.41±0.27, 1.44±0.21 and 1.88±0.17 respectively. One way analysis of variance (ANOVA) showed that there was significant difference in mean score of the children ($F_{3,880}$ = 5.89;p<0.0001). Post Hoc Tukeys Test showed that the mean score for behavioral changes was significantly highest of all and that for emotional changes was significantly lowest of all (p<0.001).

Thus lock down had significant impact on social and behavioral changes of the school going changes as they were separated from society due to lock down. But it affected emotional and pain/somatic changes of the children mildly.

In the emotional group, 24.9% children were not affected in any way by the extended lockdown and had a score of '0'. But out of these 58.9% had mild pain, 32.7% had moderate pain, 1.8% had severe pain and 7.3% had no pain as per their VAS score. One of the reasons that majority of children had only mild changes can be the availability of both parents at home at all times due to the lockdown. Working parents otherwise face a problem of not being able to have a quality time with their kids.

Table 3: Distribution of children according to their PER Score (n=221)

PER Score	Frequency	Percent
0.00	2	0.9
1.00	8	3.6
2.00	7	3.2
3.00	17	7.7
4.00	24	10.9
5.00	32	14.5
6.00	34	15.4
7.00	27	12.2
8.00	16	7.2
9.00	21	9.5
10.00	11	5.0
11.00	9	4.1
12.00	1	0.5
13.00	7	3.2
14.00	1	0.5
15.00	3	1.4
16.00	1	0.5
Total	221	100.0
Mean ± SD	6.45±4.36	
Median	6.12	
Range	0-16	

The mean (mean±s.d.) of the respondents was 6.45±4.36 with median 6.12 and the range was 0-16.

PER score shows that majority of children (49.3%) were in mild pain, 40.7% children did not experience any pain of lockdown. 9.5% had moderate pain and only 0.5% had severe pain which is negligible and insignificant. (Table No 2).

The results of intergroup comparison using Two Way ANOVA Test revealed that changes in age and their interaction (Changes *Age) were not significant (p>0.05). But the difference in scores of various categories was found significant (p<0.001).

Post Hoc Tukey Test was applied and we analyzed significant relation among four categories with age and between two age groups (Group I, 5-10 years and Group II 11-15 years). We found p value is statistically significant between the different categories like emotional and social (< 0.05) whereas it was insignificant between the two age groups. When we analyzed this data group to age interaction, p value was also found non-significant.

If we dig deeper in between groups, we found behavior category is more significantly correlated with emotional and pain categories, and social category is significantly correlated with emotional category. Rest other categories interaction are not significantly correlated.

There is a statistically significant difference between Behavior and Emotional, Behavior and Pain & Emotional and Social categories (p<.0005).

When VAS was correlated with all four categories, scores of emotional and that of behavior pain categories don't correlate at all. Whereas scores of social category had mild influence and that behavior category has moderate influence on VAS score.

But both these categories are not sufficient to have significant influence due to small sample size. We cannot conclude that they have any significant impact on pain threshold (VAS).

Discussion

'Stress' is a state of physiological, physical or psychological disharmony or threatened homeostasis. In a medical or biological context stress is a physical, mental or emotional factor that causes bodily or mental tension. Stresses can be external (from the environment, psychological or social situations) or internal (illness or from a medical procedure). Any perceived or actual threat is capable of triggering the central and peripheral components of the body to cope with this. Stress modulates and in our study, we felt the need to correlate between stress due to lockdown and its induced pain evaluation response in terms of social, behavioral, emotional and somatic category.

We observed that our target population i.e. the children in Indian nuclear urban families had mild changes in social outlook comprising 57.5% study population. 29-28% respondents are worried that they do not enjoy things as much as before and are worried that others do not want to be with them. A significant correlation of social factors with emotional factors was observed; reduced social contact because of travel and quarantine restrictions, lost social interaction and lack of structured routines may lead to increased screen time, decreased physical activity, and lack of concentration, anxiety and early depression.

The Visual Analogue Scale (VAS) score was mild for 74.7% participants. So most of our study population did not have any alteration in painful perception.

Emotional impact of lockdown due to pandemic was most visible as 31.2% i.e. 69 out of 221 respondents reported "felt like crying most of the time". 26.1% reported bad dreams of getting infected with corona virus. This predicts internalizing behavior in kids and could lead to rise in cases of post-traumatic stress disorders.

A score of 1-2 which depicts mild somatic symptoms was noticed in 72.4% children. These included affirmative responses to being worried and having increased painful sensations or somatic symptoms such as headaches followed by stomachaches.

Significant relation was analyzed between behavioral changes and painful perceptions, although VAS was not significant with any of the variables we assessed. Behavioral changes had significant impact on emotional variables and pain symptoms. This means that children in Indian nuclear families reported aches and pains more during lockdown and these were associated with behavioral problems like irritability, low mood, increased cleaning of hands and loss of interest [7]. Also these children had associated crying spells, bad dreams and fear for self and family all themed on corona pandemic [8].

Ages 11 to 15 showed greater number of participants with major issues with lockdown. We had no gender variation with respect to response to pressure cuff method [6].

Our study is new and we could not find many publications to substantiate our results. But our results are based on one to one communication with the children and we got only mild to moderate changes in behavior of children.

Various reasons may be

i) Our population is urban centric.
ii) We could not get through the slums due to the lockdown
iii) Ours was a small sample size, due to the strict lockdown and restricted movements. The parents of kids were apprehensive to permit their children being interviewed by us.
iv) Middle and higher income group subjects have easy accessibility to internet and various gadgets like mobile phones, laptop and computers. Many families got the opportunity first time ever to spend quality time with children and they got indulged with their kids.

Severe changes could not find a way in emotionality and behavior of Indian children could be because the lockdown has provided people with more free time. In fact the lockdown has also given rise to spending quality time of both parents with children including online socializing and relaxation.

We can say that if lockdown would have extended beyond three months or if any of the parents got infected and their children had to live forcibly away from them in isolation or quarantine, moderate changes may have accentuated to severe forms which might have converted to social and somatic changes.

Sprang and Silman [9] also showed that the mean post-traumatic stress scores were four times higher in children who had been quarantined than in those who were not quarantined.

In response to their feeling about corona virus, most children identified it as a deadly virus, some are quite aware of its infectivity and contagiousness too! Children are mostly scared and hate the virus wholeheartedly. These psychological feelings of fear and worry have been reported by Saurabh *et al.* [10] This gives rise to the anxiety as to when a vaccine or cure will be available.

Conclusion

This study analyzed various social, behavioral, emotional and somatic response of urban school going children as an effect of corona virus pandemic and lockdown. No

significant pain sensitivity is observed as evident by unaltered VAS score in most of the cases in relation to any of the variables.

Significant correlation was established between behavioral changes and painful perceptions. Behavioral changes had significant impact on emotional variables and pain symptoms. Hence mild to moderate changes in behavioral and emotional aspect of urban children due to corona virus pandemic is the outcome of the study. However severe changes might be inevitable in case of extended lockdown.

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