Socio-Economic Status of Gas Victims Over 30 Years

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Abstract- The industrial disaster took place in the pesticide plant of Union carbide on midnight of 2nd-3rd December 1985 is the worst industrial disaster happens to mankind till now which kills around 3800 lives instantly and about 5000 lives in three days of the accident with more than 2,00,00 people suffered with physical disabilities and medical morbidities. After interference and moderation of Supreme Court, UCIL pays a sum of $470 million as compensation for the disaster. Meanwhile, instantly after disaster, State Government has taken step and given immediate economic relief and started various relief and rehabilitation programs for the gas victim families to bring them back to the mainstream and make these people economically independent. Various studies so far has been conducted on the medical aspects but very few were targeted towards the socio-economic status of the victims. This study is such an attempt for assessing the actual status of victims over a period of 30 years. This study concludes that there is significant differences in the present status of the victim families in terms of income, savings, possession of assets and availing the standard of various facilities like medical and education as compared to the status hold in the period of 1985-85.

Index Terms- Disaster, Methyl Isocyanate, Pesticide, Socio-economic, Rehabilitation.

1. INTRODUCTION

For improving the wheat production, India has decided to bring wheat seed from Sonora region of Mexico which somewhat resistant to drought, rain and wind but requires fertilizers to grow. So government started approving the fertilizers and pesticide plant all over the country. A company named Union Carbide Corporation from Virginia, USA has set their Indian subsidiary plant at Bhopal for manufacturing fertilizer and pesticide. The capacity of UCIL plant is much larger and the demand is slow hence, they stored the pesticides in the plant. On the midnight of 3rd December 1984, one of the chemical named Methyl Isocyanate (MIC) required to manufacture pesticide get leaked from the tank results in the disaster. The underground toxic gas tank emitted a huge cloud of deadly fumes in the night spreading in different directions according to the prevailing winds and the low ambient temperature of December.

Bhopal city has been divided into 56 wards as in 1984 out of which 36 wards were get affected with the toxic gas of MIC and 20 were found not affected. The division of affected areas was done on the basis of number of people deceased due to toxic gas inhalation in three days of the leakage. The affected 36 wards were again classified as Severely affected, Moderately affected and Mildly affected. Initially after the disaster, State Government released a fund of Rs. 1 crore as relief fund and later released a sum total of Rs. 38.08 crores for the relief of the gas victim families. The State government disbursed an amount of Rs. 1500 to the affected family having monthly income less than Rs. 500 and Rs. 10,000 per person deceased in the disaster. Later on, with the intervention and mediation of Supreme Court of India,

UCC promised to pay a sum of $470 million as compensation and in turn government has agreed to drop all the criminal charges against UCC. . Out of 1029,517 claims for compensation 574,376 claims were awarded compensation for personal injury up to October 2013. On war footing State Government had implemented various relief and rehabilitation measures.

The beneficiary families identified for disbursement of compensation on the basis of the socio-economic study conducted by Tata Institute of Social Science. A sum of Rs. 360 crores is announced as interim relief by the Government of India for all the residents of 36 affected wards of Bhopal with the amount of Rs. 200/month per head in the core and severely affected areas from 1st April 1990. An estimated amount of Rs. 67.24 crores has been spent by State Government till 31st March 1990 on various rehabilitation and relief measures. The Government has spent around Rs. 258 crores on various medical, economic, social and environmental rehabilitation. Government has set up 6 hospitals for better treatment of the victims and also avail the facility of drinking water supply as the ground water is get contaminated due to toxic gas. Different training programmes and skill development programmes has been started in associating with NGO's to impart the employability skills among the family member of the victim families so as to make them economically independent. ITI and industrial sheds has also been established which were given to private entrepreneurs to provide the employment to the members who successfully completed the ITI course.

2. AIM & HYPOTHESIS

Number of studies has been conducted on the victims of gas tragedy and the accident but majority of them were focuses either on the medical aspects assessing the impact of MIC on health or on chemical aspects with respect to identifying the possible causes of the accident and very few of them have targeted on the socio-economic aspects. Also it was assumed that with such relief and compensation amount and rehabilitation programmes set up by the government, victim families has got overcome from the disaster and becomes economically stable in these 30 years. Hence, the aim of this study is to assess the change in socio-economic status of the victim families over 30 years of period. In the light of the above statement, following hypothesis has been formulated:

H01: There exist no significant differences in earnings of the affected families over 30 years of time.
H02: There exist no significant differences in the housing, education and health facilities availed by the affected families over 30 years of time.
H03: There exist no significant differences in the possession of assets by the affected families over 30 years of time.

3. METHODOLOGY ADOPTED

For assessing the change in socio-economic status of the affected families, causal research design is adopted with reference of the status hold in 1984-85 and by 2015. Severely affected and Moderately affected families were considered as two quotas and a sample of 400 respondents (equal from each quota) has been drawn using convenience sampling technique. A self-structured questionnaire is designed to collect the data through interview method among the sample respondents. Pre testing for reliability of the instrument is done through pilot study on 10% of the actual sample. The instrument is send to a subject expert and statistics expert of checking both face validity and content validity. The data collected from the interviews is filled in SPSS software version 21 for further analysis.

4. DATA ANALYSIS & DISCUSSION

4.1. *Demographic profile of respondents*

From the given table 1, it can be clearly observed that the sample population is skewed towards male population at about 64% indicating the greater participation by male diaspora whereas female respondents are only 35%.

Table 1: Demographic profile (n=400)

Particulars		Frequency	Percentage
Gender	Male	257	64.3
	Female	143	35.8
Age	Upto 25	31	7.8
	26-30	61	15.3
	31-35	87	21.8
	36-40	168	42
	Above 40	53	13.3
Marital Status	Married	248	62
	Unmarried	93	23.3
	Separated	25	6.3
	Divorced	12	3
	Widowed	22	5.5
Literacy	Primary	31	7.7
	High School	57	14.3
	Higher Secondary	89	22.3
	Graduate	174	43.5
	PG & Above	49	12.2
Type of Occupation	Govt. Employee	89	22.2
	Private Employee	171	42.8
	Self-employed	87	21.7
	Others	53	13.3
Religion	Hindu	339	84.8
	Muslim	21	5.3
	Christen	24	6
	Others	16	4
Social Status	ST	31	7.8
	SC	98	24.5
	OBC	127	31.8
	General	144	36
Nature of Family	Nuclear	284	71
	Joint	116	29
Size of the family	Up to 3 Members	52	13
	4 - 5 Members	112	28
	5 - 6 Members	120	30
	Above 6 Members	116	29

It was also found that majority of the respondents are in the age group of 31 - 40 years (about 64%) and are married (62%) whereas as some are unmarried (23.3%) and very few are separated (6.3%), divorced (3%) or widowed (5.5%). The sample has also the largest chunk of respondents as graduate (43.5%) and higher secondary (22.3%) whereas some have education up to high school (14.3%) or primary level (7.7%) and very few of them have education level of PG & above (12.2%). The sample consist of majority of service class people in which around 42.8% people were in private jobs whereas about 22.2% were in government jobs and some were doing business (21.7%). Religion wise the study area is dominated by Hindus (85%) followed by Christen community (6%). Majority of group members belongs to General

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category with 36% followed by OBC at 32%, SC at 24.5% and ST at 7.8%. Majority of respondents have nuclear families (71%) with family size of more than 4 members (89%). Overall the sample for study is a fair representation of the population since the study was conducted mainly among the households who were majorly affected in the disaster of 1984.

H01: There exist no significant differences in earnings of the affected families over 30 years of time.

Table 2 presents the monthly income aspects of affected people at the time of accident and today's scenario and a gradual shift in terms of raised income was seen clearly.

Table 2: Monthly income status of the people

STATUS OF MONTHLY INCOME

Particulars	Before 1985		By 2015	
	Freq	%	Freq	%
Below 15,000	338	84.5	177	44.3
15,001 - 30,000	42	10.5	138	34.5
30,001 - 45,000	20	5	50	12.5
Above 45,000	-	-	35	8.7

Wilcoxon rank test on income status at 1985 and 2015 was performed and it was found that none of the respondents moved to negative ranks whereas about 218 respondents were moved to higher ranks and about 182 respondents were on the same ranks. This shows that income of 218 people has been raised significantly over a period of 30 years whereas income of around 182 people is still on the same level.

Table 3: Wilcoxon rank test (Earnings in 1985 and 2015)

Ranks

		N	Mean Rank	Sum of Ranks
Monthly income 2015 - Monthly income 1985	Negative Ranks	0[a]	.00	.00
	Positive Ranks	218[b]	109.50	23871.00
	Ties	182[c]		
	Total	400		

a. Status of monthly income 2015 < Status of monthly income 1985
b. Status of monthly income 2015 > Status of monthly income 1985
c. Status of monthly income 2015 = Status of monthly income 1985

Table 4: Test statistics of Wilcoxon rank test (Earnings in 1985 and 2015)

Test Statistics[a]

	Status of monthly income 2015 - Status of monthly income 1985
Z	-13.743[b]
Asymp. Sig. (2-tailed)	.000

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.

By examining the final **Test Statistics** table, it was found that there is a significant change in earnings of the people over a period of 30 years (p = 0.000). Based on the change in median value (Pre = 1.000, Post = 2.000) and Z score statistics (Z = -13.743, p = 0.000) it was concluded that there is a statistically positive significant change in the earnings of people over 30 years of time from 1985 to 2015 which shows that people were earning much more money as compared to previous time.

H02: There exist no significant differences in the housing, education and health facilities availed by the affected families over 30 years of time.

(a) Ownership of House

On assessing the status of the ownership of the house in past and current scenario by the affected people, it was found that previously majority of people use to live on rent (51.5%) whereas some possess their own house (46.3%) and very few of them use to live in house of others. Over a period of 30 years, the scenario is found changed where majority of people now possessed their own house (59.8%) whereas some still lives in rental houses (37%) and in others house as well (3.3%). A change in percentage has been seen which may be the result of rise in the family monthly income.

Table 5: Ownership status of the house

OWNERSHIP STATUS OF HOUSE

Particulars	Before 1985		By 2015	
	Freq.	%	Freq.	%
Rental	206	51.5	148	37
Owner	185	46.3	239	59.8
Living in others house	9	2.3	13	3.3

Wilcoxon Signed Ranks Test and Chi-square is used to assess the changes in the ownership status of the house of the affected families over a period of 30 years. We can see from the table's legend that none of

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the respondents have been moved to negative rankings from higher rankings from the period of 1985 to 2015 whereas 58 people have found a positive significant in ownership of the house and 342 respondents were found with no significant change in their ownership status of the house from the period of 1985 to 2015.

Table 6: Wilcoxon rank test (Ownership of house in 1985 and 2015)

Ranks

		N	Mean Rank	Sum of Ranks
Ownership of house 2015 - Ownership of house 1985	Negative Ranks	0[a]	.00	.00
	Positive Ranks	58[b]	29.50	1711.00
	Ties	342[c]		
	Total	400		

a. Ownership of house 2015 < Ownership of house 1985

b. Ownership of house 2015 > Ownership of house 1985

c. Ownership of house 2015 = Ownership of house 1985

Table 7: Test statistics of Wilcoxon rank test (Ownership of house in 1985 and 2015)

Test Statistics[a]

	Ownership of house 2015 - Ownership of house 1985
Z	-7.390[b]
Asymp. Sig. (2-tailed)	.000

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

By examining the final **Test Statistics** table, it was found that there is a significant change in ownership status of the affected families over a period of 30 years (p = 0.000). Based on the change in median value (Pre = 1.000, Post = 2.000) and Z score statistics (Z = -7.390, p = 0.000) it was concluded that there is a statistically positive significant change in the ownership of house by the affected families over 30 years of time from 1985 to 2015 which shows that more number of families were living in their own house rather than living on rent or in others house.

(b) Education Aspects

On analyzing the educational aspect of the affected family, it was found that majority of affected families have two or more children when this accident has took place (60.1%) whereas some families has only one child (15.5%). Among these 302 families who have children at their home, two or more children were studying in school and colleges (40.3%) whereas children of 43% families were not studying anywhere.

Table 8: Number of children in family and attending school/colleges

Particulars		Frequency	Percent
Children in family at the time of accident	Nil	98	24.5
	One	62	15.5
	Two	99	24.8
	More than two	141	35.3
How many of them were attending school/colleges at the time of disaster	Nil	172	43
	One	67	16.8
	Two	117	29.3
	More than two	44	11

While assessing the impact of disaster on the educational status of the suffered families, it was found that children of majorities of families were enrolled in government school and institutes (89%) whereas only few families will able to send their children in private school and institutes (11%). After some time of accident, majority of families has sent their children to private schools and institutes for study (60.6%) whereas some families still continue to send their children to government school and institutes (39.4%). The reason behind this change can be the amount received by the suffered families in form of compensation which makes families able to give better education to their children.

Table 9: Education status of the children

EDUCATION STATUS

Particulars	Before Accident		After Accident	
	Freq.	%	Freq.	%
Govt. School/Inst.	203	89	90	39.4
Private School/Inst.	25	11	138	60.6

Wilcoxon Signed Ranks Test and Chi-square is used to assess the differences in the educational status of the children of the affected families over a period of 30 years. We can see from the table's legend that only 1 respondent have been moved to negative rankings from higher rankings from the period of 1985 to 2015 whereas 114 people have moved to positive rankings showing the significant changes in educational status of the children and 113 respondents were found with no significant change in the educational status of the children from the period of 1985 to 2015.

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Table 10: Wilcoxon rank test (Educational status in 1985 and 2015)

Ranks

		N	Mean Rank	Sum of Ranks
Studying 2015 - Studying 1985	Negative Ranks	1[a]	58.00	58.00
	Positive Ranks	114[b]	58.00	6612.00
	Ties	113[c]		
	Total	228		

a. Where are they studying 2015 < Where are they studying 1985

b. Where are they studying 2015 > Where are they studying 1985

c. Where are they studying 2015 = Where are they studying 1985

Table 11: Test statistics of Wilcoxon rank test (Educational status in 1985 and 2015)

Test Statistics[a]

	Where are they studying 2015 - Where are they studying 1985
Z	-10.537[b]
Asymp. Sig. (2-tailed)	.000

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

By examining the final **Test Statistics** table, it was found that there is a significant change in the educational status of the children of the affected families over a period of 30 years (p = 0.000). Based on the change in median value (Pre = 1.000, Post = 2.000) and Z score statistics (Z = -10.537, p = 0.000) it was concluded that there is a statistically positive significant change in the educational status of the children of the affected families over 30 years of time from 1985 to 2015 which shows that more number of families were now sending their children to private school and institutes for better education.

(c) Health Aspects

Analysis of medical treatment aspects reports that majority of people immediately after the accident by during the period of 1985 used to visit government hospitals for their treatments (67.75%) whereas some visit private hospitals (22.75%) and few used to get treatment either in private nursing homes (6.25%) or by private physicians at their clinics (3.325%). By 2015, a drastic change in the preferences of people have been recorded which may be the result of increase in family income and degrading quality of government facilities where only some people use to get treatment from government hospitals (21.75%) whereas as majority of people prefers private doctors either in private hospitals (24.5%), nursing homes (20.5%) or at the private clinics (33.25%).

Table 12: Medical treatment status

MEDICAL TREATMENT

Particulars	Before 1985		By 2015	
	Freq.	%	Freq.	%
Government Hospitals	271	67.75	87	21.75
Private Hospitals	91	22.75	98	24.5
Private Nursing Homes	25	6.25	82	20.5
Private Clinics	13	3.25	133	33.25

Wilcoxon Signed Ranks Test and Chi-square is used to assess the differences in the health and treatment status of the peoples of the affected families over a period of 30 years. We can see from the table's legend that none of the respondents have been moved to negative rankings from higher rankings from the period of 1985 to 2015 whereas 268 people have moved to positive rankings showing the significant changes in health and treatment status of the affected families and 132 respondents were found with no significant change in the health and treatment status from the period of 1985 to 2015.

Table 13: Wilcoxon rank test (Health and treatment status in 1985 and 2015)

Ranks

		N	Mean Rank	Sum of Ranks
Visit for treatment 2015 – Visit for treatment 1985	Negative Ranks	0[a]	.00	.00
	Positive Ranks	268[b]	134.50	36046.00
	Ties	132[c]		
	Total	400		

a. Where do you normally visit for medical treatment 2015 < Where do you normally visit for medical treatment 1985

b. Where do you normally visit for medical treatment 2015 > Where do you normally visit for medical treatment 1985

c. Where do you normally visit for medical treatment 2015 = Where do you normally visit for medical treatment 1985

Table 14: Test statistics of Wilcoxon rank test (Health and treatment status in 1985 and 2015)

Test Statistics[a]

	Where do you normally visit for medical treatment 2015 - Where do you normally visit for medical treatment 1985
Z	-14.429[b]
Asymp. Sig. (2-tailed)	.000

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a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.

By examining the final **Test Statistics** table, it was found that there is a significant change in the health and treatment status of the affected families over a period of 30 years (p = 0.000). Based on the change in median value (Pre = 1.000, Post = 3.000) and Z score statistics (Z = -14.429, p = 0.000) it was concluded that there is a statistically positive significant change in the health and treatment status of the affected families over 30 years of time from 1985 to 2015 which shows that more number of families were now visiting to private physicians and nursing homes rather than visiting to government hospitals for their treatment.

H03: There exist no significant differences in the possession of assets by the affected families over 30 years of time.

When assess the economic status of the affected families in terms of possession of assets at the time of 1985 and 2015, it was found that number of people possessing various assets has been significantly increased by 2015 as compared to the time of 1985. McNemar Test and Chi-square is used to assess the differences in the possession of assets by the affected families over 30 years of time.

Table 15: Possession of assets by the people

POSSESSION OF ASSETS

Particulars	Before 1985				By 2015			
	Yes	%	No	%	Yes	%	No	%
Own House	187	46.8	213	53.3	307	76.8	93	23.3
Land	87	21.8	313	78.3	138	34.5	262	65.5
Other Property	38	9.5	362	90.5	67	16.8	333	83.3
Jewelry	176	44	224	56	353	88.3	47	11.8
Vehicle (2 Wheeler/ 4 Wheeler)	95	23.8	305	76.3	387	96.8	13	3.3
Electronic Appliances	128	32	272	68	391	97.8	9	2.3
Home Appliances	82	20.5	318	79.5	395	98.8	5	1.3
Furniture	311	77.8	89	22.3	397	99.3	3	0.8

Table 16: Cross tabulation of Possession of assets by the people between 1985 and 2015

	1985	2015	
		Yes	No
Own House	Yes	172	15
	No	135	78
Land	Yes	80	7
	No	58	255
Other Property	Yes	38	0
	No	29	333
Jewelry	Yes	176	0
	No	177	47
Vehicle (2 Wheeler/ Wheeler)	Yes	95	0
	No	292	13
Electronic Appliances	Yes	128	0
	No	263	9
Home Appliances	Yes	82	0
	No	313	5
Furniture	Yes	311	0
	No	86	3

From the cross tabulation analysis of possession status of various assets by the people in 1985 and 2015, it was found that majority of people has been moved to the positive ranks and none of them has moved to negative ranks means people who have not possessed assets in 1985 has possessed the assets by 2015 but none of the people who has already possessed an asset in 1985 has loosed its possession by 2015. This shows a significant positive and upward movement of the lifestyle and economic status of the affected families over a period of 30 years.

Table 17: Chi square of Possession of assets by the people between 1985 and 2015

Test Statistics[a]

	Own House 1985 & Own House 2015	Land 1985 & Land 2015	Other Property 1985 & Other Property 2015	Jewelry 1985 & Jewelry 1985
N	400	400	400	400
Chi-Square[b]	94.407	38.462	27.034	175.006
Asymp. Sig.	.000	.000	.000	.000

a. McNemar Test
b. Continuity Corrected

Test Statistics[a]

	Vehicle (2 Wheeler/4 Wheeler) 1985 & Vehicle (2 Wheeler/4 Wheeler) 2015	Electronic Appliances 1985 & Electronic Appliances 2015	Home Appliances 1985 & Home Appliances 2015	Furniture 1985 & Furniture 2015
N	400	400	400	400
Chi-Square[b]	290.003	261.004	311.003	84.012
Asymp. Sig.	.000	.000	.000	.000

a. McNemar Test
b. Continuity Corrected

By examining the final **Test Statistics** table, it was found that there is a significant positive change in the possession of all the assets by the peoples 2015 (p =

0.000). Based on the Chi-square statistics it was concluded that there is a statistically positive significant change in the possession of all the assets by the affected families over 30 years of time and more number of families now possessed all the assets by 2015 as compared to 1985.

5. CONCLUSION

The aim of this research is to find out the change in the socio-economic status of the gas victims over 30 years of period due to the compensation availed and various rehabilitation as well as relief schemes provided by the government. This study concludes that there is a significant positive change is found in the status of affected families by 2015 as compared to 1985 in terms of possession of own house and various assets. A significant positive change is also found in the preferences of people with respect to the health care and educational facilities as well as the income of the people which shows that affected families are now slowly coming to the mainstream. Still a lot of emphasis needs to be given on the poorer section of the society as they were still fighting to overcome with the disaster and living miserable life. Government has to adopt suitable measures targeted to this weaker section of the society so as to make them economically sound and helps them to overcome the impact of the disaster.

REFERENCES

[1] Bhopal Gas Tragedy Relief and Rehabilitation Department. 2007a, 2010b, 2013. "Smarika" Bhopal, India: Madhya Pradesh Government. December 3.

[2] Bhopal Gas Disaster Research Centre.1994. "Technical Report on Population Based Long Term, Epidemiological Studies (1985-1994)" Bhopal, Indian Council of Medical Research.

[3] Bhopal Gas Tragedy Relief & rehabilitation Department. (nd.) "Work done by Government of Madhya Pradesh for Gas Tragedy Victims" Bhopal, Government of Madhya Pradesh.

[4] Bijoy, C.R. (2002). "Report on the Role of Non-governmental Organizations and Peoples Organizations" Bhopal, Fact finding mission on Bhopal.

[5] Broughton, E. (2005). "Bhopal disaster and its aftermath: a review" New York, Columbia University, Mailman School of Public Health. Available at ww.ehjournal.net/content/4/1/6

[6] Brown, M. (2009). "MP calls for justice for victims of Bhopal gas disaster" Bhopal, Telegraph Media Group limited. Available at www.bhopal.org

[7] Directorate of Bhopal Gas Relief & Rehabilitation (1997). "Brief Note on Bhopal Gas Tragedy Relief and Rehabilitation" India, Government of Madhya Pradesh.

[8] Mahaprashasta, A.A. (2010). "Bhopal Gas Disaster Ongoing Tragedy" India, Frontline.

[9] Nair, A. (2001). "Extent of Chemical Contamination of Human and Environmental samples around residential areas adjoining The Union Carbide India Ltd" New Delhi, The Other Media.

[10] Nair, M. (2005). "Bhopal Gas Tragedy – A Social, Economic, Legal and Environmental Analysis" Kerala, MPRA Munich Personal RePEc Archive. Available at http://mpra.Ub,Uni-muenchen.de/37856

[11] Scandrett, E. and Mukherjee, S. (2011). "Globalization and Abstraction in the Bhopal survivors' movement". A journal for and about social movement. Volume 3(1): 195-209.

[12] Malik, V. et al. (1991). "Socioeconomic Impact of Disbursement if interim relief to Gas affected families of Bhopal". Bhopal. Academy of Administration, Government of Madhya Pradesh.

[13] Sarangi, S. (2012). "Compensation to Bhopal gas victims : will justice ever be done" Bhopal, Indian Journal of Medical ethics

[14] Sathyam, S. et.al. (1990). Bhopal, "A Socio-Economic study of the effect of disbursement of interim relief to the Gas victims of Bhopal". Centre for Rehabilitation Studies.

[15] Sharma, D.C. (2005). "Bhopal: 20 years on" The Lancet, Vol. 365 issue 9454 (111-112) January 8, 2005.

[16] Varma, S. (2009). "Bhopal Gas Tragedy: Endless nightmare". Bhopal. TNN, December 3.

[17] Venkatesan, V. (2010). "Bhopal Gas Disaster Judicial failure". India, Frontline.