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Patterns of Mortality Caused by Natural Disasters and Human Development Level: A South Asian Analysis

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ABSTRACT

This study aimed at exploring the correlation between the patterns of mortality and affected people caused by natural disasters and human development level at country level in South East Asia (SEA). The study utilized quantitative data on deaths and affected people caused by natural disasters from CRED and other databases. Huge deaths and affected people concentrated on lower HDI countries in comparison with middle ones in SEA. Desegregated disaster subtypes, overlapping data, no universal scale about severity and magnitude measurement demonstrated lead barriers for conducting statistical test between impact variables and development level with value. With the combination of all parameters of natural disaster scales, a universal and accepted scale might be suggested to avoid misleading in disaster data collection and thereby develop scientific techniques for vulnerability assessment.

Keywords: *Natural disaster; Mortality; Affected people; South East Asia; Human development level*

INTRODUCTION

Large scale natural disasters have demonstrated unprecedented deaths and affected people based on severity and magnitude for the past decades around the world. Though natural hazards are connected with geographical fault lines, climatic shifts and meteorological extreme events, decrease in widespread deaths and affected people largely depends on country specific health system, existing logistics, coping strategies and human development level. Globally, 4000 massive natural disasters had been accounted for estimating 1.5 million deaths during 2005-2015. Several studies on natural disasters related mass causality and affected people have often turned into hazard and event specific disasters in the global settings.[1] Existing disaster documents reveal that there is a great gap of adequate information on country specific mortality and affected people caused by hydro-meteorological and geophysical disasters and its relation with human development value.[2] Disaster management logistics and preparedness initiatives have carried conviction for few people in low resource settings. In high income settings, people's exposure to deaths and affected people accounts for estimating lower rates due to strong disaster policy, existing coping resources. SEA is one of the most disaster-prone regions in the world. Geologically, the subcontinent is situated in the active tectonic plate movements in the India Ocean, which have been the source of major earthquakes and tsunamis. Climatic variability, tropical monsoons, and proximity to the coastlines are the direct risk factors for generating tropical cyclones and storms in the Indian Ocean.[3]

Natural disasters pose for occurring sudden or slow onset furious impacts with atmospheric, hydrologic and geologic roots.[4] Around five million deaths and millions more injuries worldwide are the direct consequences of disasters since 1960. Most of the deaths have concentrated in developing countries. As a single disaster, drought has killed over 2.5 million people

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while earthquakes caused 1 million more fatalities. Furthermore, storms and cyclone claimed over 750, 000 deaths during the last decades.[5] Over the past twenty years, more than 50% of all fatalities were reported in low human development countries though they shared only a tenth of those exposed to natural disasters. Subsequently, around 85% of the people exposed to natural disasters are the inhabitants of medium and low human development countries.[6] Deaths are the direct result of sudden onset natural catastrophe while affected is an aggregated figure of all injured, homeless and affected during the period of disaster.[7] The HDI refers to the geometric mean of normalized indices for three dimensions separately.[8] As a dimension of health for HDI, life expectancy has observed a disproportionate increase over the past quarter century. Education and standard of living, based on mean of years of schooling and per capita income[8] respectively are attributed to promise improved socio-economic status through increasing livelihood capacities, housing in low risk areas, expensive disaster insurance and adequate access to warning and evacuation information system. The overall objective of the study is to explore the patterns of mortality and affected people caused by natural disasters and their relationship to the level of human development at country level in SEA.

MATERIALS AND METHOD

The study approached a content analysis of academic research articles, conference papers and scientific documents based on mortality and affected people caused by natural disasters in the duration of 2014-2015. This study employed quantitative method of data collection. Deaths and affected data had been primarily collected from CRED database (EM-DAT). For measuring the severity and magnitude of each disaster, the study also used quantitative data from Relief web, OCHA, UNDP, Flood list, Wikipedia and different media sources. The researcher checked and rechecked data repeatedly from multiple sources for verifying the validity.

Concentrating on multiple scales for measuring magnitude level, a general scale valued 1 to 5 had been adopted for combining original disaster magnitude levels into a standardized benchmark. This piece of work utilized human development value from UNDP country reports and correlated impact variables caused by disasters for the duration of 2014-2015. The duration of data collection took two months, May to June, 2016. The collected data had been analyzed by using descriptive statistics in SPSS version 20. Multi variate analysis was administered for correlating impact variables caused by natural disasters with the value of country specific human development index.

RESULTS

Table 1: Profile of deaths caused by natural disasters 2014-2015

Disasters	Frequency	Deaths	Percent (%)
Earthquake	13	9457	52.84
Extreme temperature	6	3796	21.21
Flood	40	3160	17.66
Landslide	15	997	5.57
Storm	17	483	2.70
Total	**92**	**17, 897**	**100.00**

The table 1 shows that there was no relation between number of disaster episodes and number of deaths occurred in SEA. Out of 92 natural disasters recorded, approximately 53% deaths occurred due to earthquakes while 21.21% fatalities occurred due to extreme temperature in the past two years. More frequency of disaster episodes does not demonstrate incidence of deaths higher or lower in the current study. In the study, 17.66%, 5.57% and 2.70% deaths were reported from flood, landslide and storm respectively.

Patterns of Mortality and Affected People and HDI

Mortality and HDI

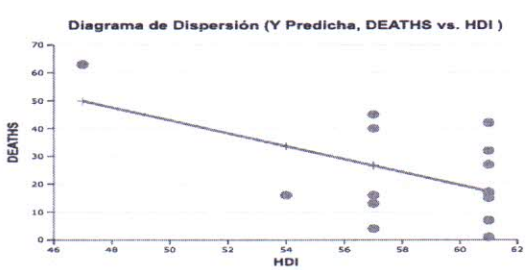

Figure 1: Number of deaths and HDI

The figure 1 shows that over 60 deaths were reported for HDI 0.47 in Afghanistan while around 40-0

deaths were noted for HDI 0.61 in India and Bhutan respectively. The number of deaths lowered when the value of HDI showed an increase in the line graph data. It was observed that deaths caused by natural disasters had a positive correlation with the level of human development for each country. It was an inverse or indirect correlation between deaths and HDI variables. This relationship was considered statistically significant in the study. So, it was clearly found that deaths caused by natural disasters followed a positive correlation with the value of human development for each specific country.

Flood occurred mortality and HDI level

In the case of floods, there was also an inverse correlation between the value of human development index and the number of deaths and this correlation was shown as statistically significant.

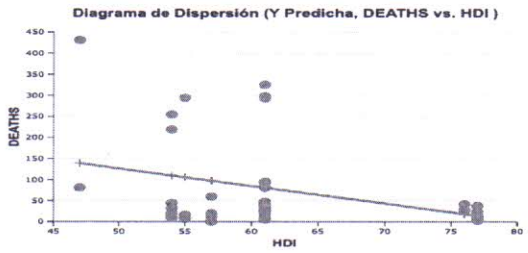

Figure 2: Deaths caused by flood and HDI

With regard to explaining deaths caused by flood during 2014-2015, it was clearly found that nearly 450 deaths were identified for lowest HDI 0.47 while less than 50 deaths were reported for the highest HDI 0.77 in the study line graph 2. The study data on flood demonstrated that deaths followed an inverse statistical relationship with the level of HDI in quantitative study.

Storm induced deaths and HDI value

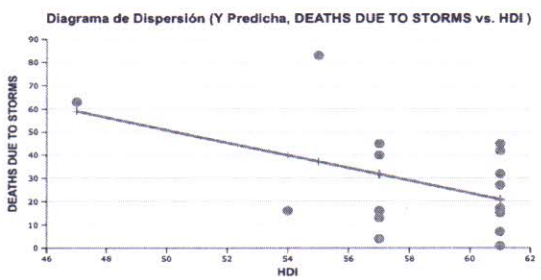

Figure 3: Correlation between deaths and HDI

In the graph 3, it was clearly noted that over 80 deaths caused by storms were identified for HDI score 0.55 of Nepal while around 60 deaths caused by storms were reported for HDI value 0.47 of Afghanistan in the study. Most of the reported deaths caused by storms followed a slight declination for higher HDI countries in the figure. In addition, more deaths caused by storms demonstrated for lower HDI values in comparison with higher ones in the study. The relationship between variables was negative or indirect but reported as statistically significant.

Correlation of Mortality based on Standardized Magnitude (SM) and HDI

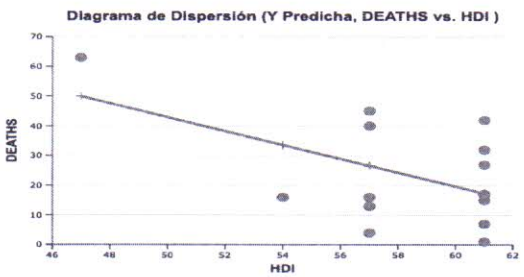

Figure 4: Deaths of SM 1 and HDI

Overall, it was found that over 60 deaths caused by disasters of magnitude one were reported for low HDI score 0.47 in Afghanistan focused in the graph 4. The number of deaths of magnitude one declined sharply following higher HDI value in the study. It was an indirect or negative correlation between deaths caused by disasters and HDI level. It was considered as statistically significant in the study.

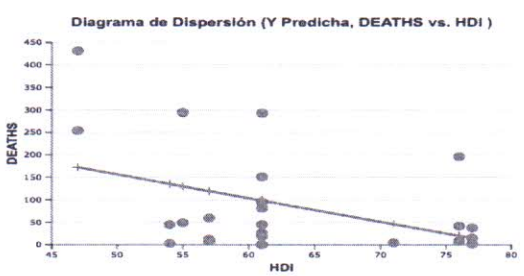

Figure 5: Deaths of SM 3 and HDI

In case of disaster magnitude 3, approximately 450 deaths were noted for lowest HDI value 0.47 in Afghanistan while around 5 deaths were reported for highest HDI values in Iran and Sri Lanka respectively (Figure 5).

DISCUSSION

Mortality Trends and Human Development Level

The SEA has experienced large scale disasters and widespread deaths and affected in the past couple of years. The frequency and destructiveness of natural hazards have found a considerable increase during the last 30 years.[9] Likewise, in comparison with disaster impacts in 2014, a higher proportion in deaths and affected people caused by natural disasters was found in 2015. Overlapping in data records, misleading in database records and multiple characters of similar natural disasters usually limit higher statistical analysis to connect disaster impact factors with development variables. In World Health Organization's estimation, statistics of death and affected people vary widely due to technical challenges. Limited resources for collecting and compiling disaster related data, inadequate vital registration system, political biases and misleading in reporting were noted as the challenging barriers for reporting country wise natural disaster data.[10]

The number of deaths caused by flood, earthquake and storm were found to be statistically correlated with country specific HDI value. The relationship was indirect or negative and found statistically significant. Exposure to disasters and deaths caused by natural disasters concentrated a lot on low human development countries while more impact factors concentrate in middle human development countries in comparison with that from high human development countries. Bangladesh and the United States experienced tropical cyclone 3.4 times and 12.1 times respectively, resulting consecutive deaths of 7,468 and 223 people on average per year during the twenty years 1980-2000.[10] Landslide and extreme temperature did not find any correlation with the value of human development.

Flooding showed a significant correlation with the level of human development for country specific profile. India, a middle HDI country has experienced a fairly proportion of flood related impact factors in the past years. With the highest frequency and magnitude, deaths and affected people caused by flooding undoubtedly concentrated on the level of development. But, the correlation between level of development and impact factors were focused as inverse or indirect statistically. In case of earthquake, the findings reveal that the correlation between deaths and affected people caused by earthquake as well as structural factors becomes apparent more rather than the level of human development value. Most of earthquakes concentrated on low middle human development countries like Nepal, Afghanistan, Pakistan and India and caused large scale deaths and injuries across the region. However, the yearly approximate 250 deaths were noted from storm, in the past couple of years. Another regional study finding from SEA reveals the different results. The yearly average deaths from storm were reported approximately 2000 during the periods 2010-2014 [3].

Human Development Level and Affected from Disasters

The correlation between human development level and affected people from flood, earthquake and landslide respectively was considered indirect or inverse. It was not statistically significant relationship. In addition, no correlation was found between HDI level and affected people from storm. The most affected people from natural disasters were found for middle HDI in India during the past two years 2014-2015. Flood, the frequently occurred event in India made a significant difference with all other disaster affected people for SEA countries. It was a bit confusing to correlate all the data from affected people with development level. Limitation of data on affected people from different natural disasters had been the great barrier for correlating with development level for country specific explanation. The most obvious finding showed that affected people from natural disasters appear mostly in middle HDI countries in SEA context.

Correlation between Deaths and Affected People

Deaths caused by natural disasters demonstrated a direct or positive correlation with affected population in the past couple of years. When deaths from natural disasters find an increase, the number of affected people also finds a positive increase in the same direction. These findings are quite similar with the statistical results of yearbook 2011. Between 1991-2000 and 2001-2010, around 10 and 60 deaths per million people respectively were reported in comparison with 21 and 22 affected people per thousand people respectively from natural disasters in SEA.[11] Overall, the higher the number of deaths reported in natural disaster situations, the largest the number of affected people appeared in the database.

HDI Value and Mortality Analysis

In SEA, countries with lower HDI value experiences more deaths caused by natural disasters of lower magnitude in comparison with countries with higher HDI value. The number of deaths caused by natural disasters demonstrated comparatively higher in Afghanistan, Pakistan, Nepal, and Bangladesh in comparison with other countries in SEA in the periods 2014-2015. The correlation of deaths caused by disaster magnitude 3 with HDI value was approached negatively in the study. However, majority of deaths of disaster magnitude 3 occurred in lower HDI countries like Afghanistan, Pakistan, Nepal and Bangladesh for the past two years. Conversely, higher HDI countries Iran, Sri Lanka, Maldives, Bhutan and India experienced lower deaths for disaster magnitude 3 in the same periods. The inverse relationship was indirect and statistically significant. On the basis of standardized magnitude 2 and 4, it was noted that there was correlation between the variables. It was an indirect or negative correlation. It was not statistically significant. Fatalities from earthquake 2015 in Nepal made a considerable difference for showing more significant relationship between human development value and deaths.

CONCLUSION

SEA countries continue to experience disproportionate impacts of natural disasters. Most of the deaths from natural disasters concentrated on low human development countries like Afghanistan, Nepal, Pakistan and Bangladesh in comparison with fatalities from other middle human development countries in SEA. Disaster affected people dominated in middle HDI countries in comparison with that from low HDI backgrounds. Limitation of data on affected people, overlapped disaster data among disaster subtypes, misleading in reporting in database, and misreporting in newspapers and journals demonstrated perceived barriers for considering statistical significant and positive correlation between impact variables and HDI level. Considering different disaster indicators for measuring severity and magnitude, a universal and well accepted scale for aggregating large scale disaster data and framing benchmark might be suggested for avoiding misleading in disaster data collection and developing scientific tools for vulnerability estimation.

Conflict of Interest: None declared

Financial Disclosure: None declared

Ethical Clearance : The study was dependent on recorded data from EM-DAT database as per institutional rules. So, the study did not look for any individual consent. But, it took officially recognized institutional permission for using their reserved dataset.

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