North Asian International Research Journal of Social Science & Humanities

ISSN: 2454-9827 Vol. 8, Issue-7 July -2022

IRJIF I.F. : 3.015

Index Copernicus Value: 57.07 Indian Citation Index Thomson Reuters ID: S-8304-2016

NAIRJC A Peer Reviewed Refereed Journal

DOI: 10.5947/2454-9827/nairjc/00009.45

A STUDY ON EFFECT OF CLIMATIC CHANGE ON TRAFFIC ACCIDENTS

BILAL AHMAD BHAT[1], RASY FAYAZ CHOH WANI[2], SIDRAT-UL-MUNTAHA ANEES[3] AND SAYIMA MAJEED WANI[4]

[1]Division of Social Sciences, Faculty of Fisheries, Rangil Ganderbal, SKUAST-Kashmir, J&K
[2]Advanced Research Laboratory, Department of Zoology, University of Kashmir, Hazratbal, Srinagar – 190006 Jammu and Kashmir, India
[3]Government College for Women, M.A.Road Srinagar, Kashmir, J&K
[4]Division of Aquaculture, Faculty of Fisheries, Rangil Ganderbal, SKUAST-K, J&K

ABSTRACT

Weather and climate, as represented by several indicators (e.g. rain, storms, winds, etc), contribute to several hazards or sensitivities within the transportation sector (e.g. landslides, reduced visibility, road traction, etc). The statistics of these variables may be affected by anthropogenic climate change. People since thousands of years have associated weather and human behaviours. In current study, we chose 400 respondents at random from Kashmir valley for data collection using a well-designed validated questionnaire. The main purpose of writing this research paper was to discuss the effect of climate change on traffic accidents. The data collected was analyzed using statistical tools. The study revealed that majority of respondents 72.5% were aware of climate change and believed in last 20 years climate change showed its impact in every field of life. It has been noticed that there is an increase in temperature, unpredictable rainfall, and increase in frequency of disaster and decrease in food production. Recently in June-July 2022 there was snowfall at various places in Kashmir. Further, study revealed that majority (58.5%) of respondents were of the opinion that climate change and number of accidents is related. It has been noticed that on the basis of available data since 2014 the number of accidents reported were above 5000 except in 2020 it was slightly less (4080) due to COVID-19 pandemic. Finally, current study suggested policy instruments to control accidents in the study area amidst changing climate. Infact, a number of factors are responsible for increased number of traffic accidents and climate change can be considered as one factor.

***KEYWORDS**: Kashmir, Traffic accidents, Climate Change, Survey, Statistics*

Citation: Bhat Bilal, Wani Rasy, Anees Sidrat, Majeed Sayima (2022) A Study on Effect of Climatic Change on Traffic Accidents Vol.8, Issue 7. NAIRJC Journal of Social Science & Humanities. DOI: 10.5947/2454-9827/nairjc/00009.45

INTRODUCTION

Individuals and society may suffer significant losses as a result of traffic accidents. The World Health Organization (WHO) estimates that worldwide, traffic accidents result in 1.35 million fatalities per year and cost $518 billion USD. By 2030, traffic-related fatalities are predicted to overtake all other causes of mortality, if appropriate improvement initiatives are not implemented. Therefore, in order to increase traffic safety, it is vital to analyse the important elements influencing traffic accidents. Workplace deaths and accidents are particularly prevalent in the transportation sector. The Bureau of Labor Statistics, 2020 reports that 1,778 (37.3%) occupational deaths were caused by transportation-related events. The transportation accidents are the most frequent cause of fatal workplace injuries and transport-related accidents involving big trucks are extremely risky. Additionally, transportation accidents are very serious. Large trucks make up 9.8% of vehicles in fatal crashes despite only being involved in 3.3 percent of collisions involving injuries (National Highway Traffic Safety Administration, 2021). Therefore, it is necessary to increase transportation safety. The extant literature discusses a wide range of factors, including the economy [Al Reesi et al., 2013; Law et al., 2011; Yusuff, 2015 and Wiebe et al., 2016], climate, and traffic safety rules, that impact road traffic accidents. Few research have looked at the effects of climatic elements on fatal traffic accidents from a macro viewpoint, despite the fact that several studies have looked at the influence of weather conditions on traffic accidents [Zhai et al., 2020; Malin et al., 2019; Xing et al., 2019; Lee et al., 2018; Wu et al., 2018(a) and Wu et al., 2018(b)]. Road conditions and driving habits are impacted by climate change, which in turn affects the likelihood of traffic accidents [Chu et al., 2019; Kacan et al., 2019; Schlogl , 2020; Islam et al., 2019]. Temperature, precipitation, and wind are climatic elements influencing the traffic accident. The probability of traffic accidents is influenced by temperature, particularly by hot weather and extremely cold temperatures [Andersson and Chapman, 2011; Stern and Zehavi, 1990; Nofal, and Saeed, 1997; Bergel-Hayat, 2013; Malyshkina et al., 2009 and Wu et al., 2018].The frequency of traffic accidents would dramatically rise due to the extreme cold and slippery roads, particularly those incidents brought on by car sliding. Rainfall and other factors can also influence the likelihood of road accidents [Keay and Simmonds, 2005; Brodsky and Hakkert, 1988; Chung et al., 2005; Andrey et al., 2003; Zhan et al., 2020]. Rainy days have a much greater risk of traffic accidents than bright days. Rainfall can also increase the number of fatalities in road accidents, and the effect of wet weather varies with rainfall. Additionally, it is impossible to overlook how windy conditions affect traffic accidents on the road. Traffic accidents are more likely to occur when it is windy outside [Edwards, 1994;Baker et al., 1992]. The likelihood of road accidents rises in stormy weather when the gust speed exceeds a particular threshold. Strong winds make rollovers, sideslips, and spins more common, especially rollovers [Baker et al., 1986].

Physical-geographical investigations are necessary prior to road construction in order to prevent exposure of the future road to landslides, water retention, high-intensity wind, snowdrifts, floods, etc. [Đorđević 2004; Lovelace 2021]. Highway landscape should not be seen as a homogenous, one landscape object when considering the effects of climatic variables. Every highway stretch is unique and needs to be taken into account separately when analysing the effects of climatic factors (Sentić et al. 2018).This is required if we wish to advance further, gather evidence-based information on which highway segments should be regarded as risky, and develop suitable landscape design as a traffic safety control strategy (Lorenz 1980; Senti and Đorđević 2019). Wider approaches to highway landscape design are thought to be essential in developed European nations in order to improve traffic safety (Löfgren et al. 2018). The effect of inclement weather on traffic accidents has been investigated in several research studies [e.g., Edwards, 1996]. Road accidents and weather risks are positively correlated, according to Edwards (1996), who looked at the geographical aspect of weather-related incidents on UK roads. Seasonally and geographically, the pattern of the association between weather and accidents varies. It was also reported in research on the panel longitudinal data of traffic incidents in England and Wales during inclement weather that there is a a link between the frequency of accidents during bad weather and real weather patterns. Using a consistent methodology, Andrey et al. [2003] conducted a study on the diverse climates of mid-sized Canadian communities. The study found that the susceptibility to hazardous weather varied by city and that there was a

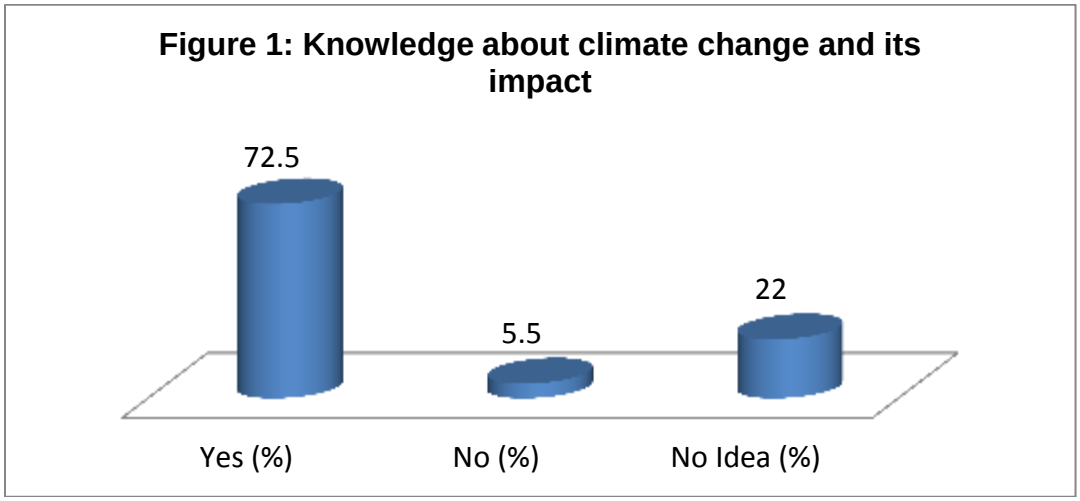
lower likelihood of harm than of accident. According to Andrey et al. [2003], precipitation caused a 75 percent and a 45 percent rise in the number of traffic accidents and injuries that resulted from them. For all accidents combined, the impacts of snowfall were more noticeable than the effects of rainfall [Andrey et al., 2003]. Snowfall was also recognized [Eisenberg and Warner 2005] as a dangerous weather event. In the light of the literature, cited above we chose present study with an aim to assess the effect of climate change on road traffic accidents in Kashmir.

METHODOLOGY

In present study, we chose 400 educated respondents at random from different parts of Kashmir valley using a well-designed validated questionnaire. The main purpose of writing this research paper was to assess the knowledge of respondents about climate change and its impact on traffic accidents. The data collected was analyzed using statistical tools and the results were presented graphically.

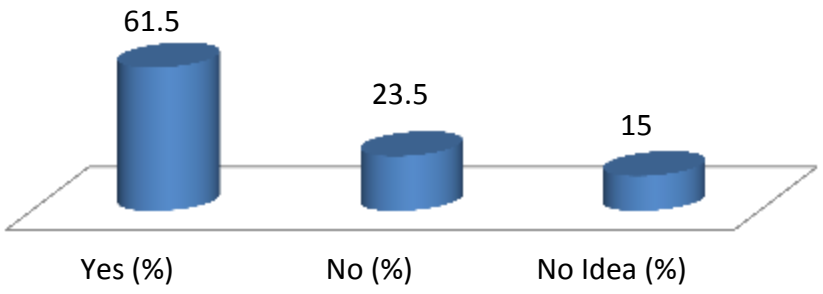
RESULTS AND DISCUSSION

The data shown in Figure 1, reveals that majority (72.5%) of the respondents on discussion revealed that they have heard and are aware about climate change and its impact.



The data shown in Figure 2, reveals that majority (61.5%) of the respondents were of the opinion that climate change has impact on every field of life. Global warming is part of the challenges facing humanity because it directly impacts the environment. It is clear that climate change has far-reaching effects as well as increasing the number of traffic accidents.

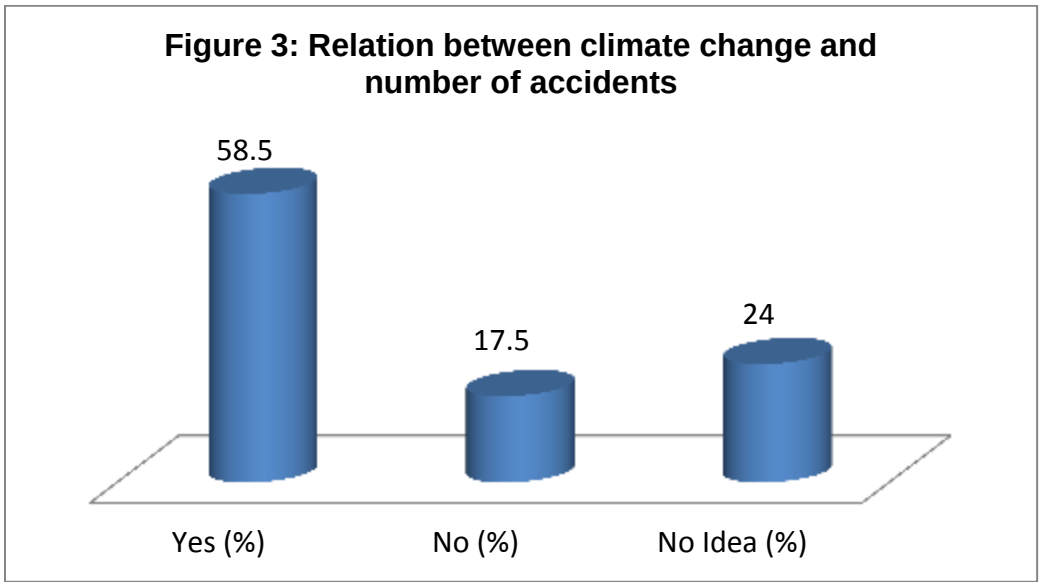
Figure 2: Do you feel in last 20 years climate change plays its role in every field of life



Climate change result in more traffic /car accidents

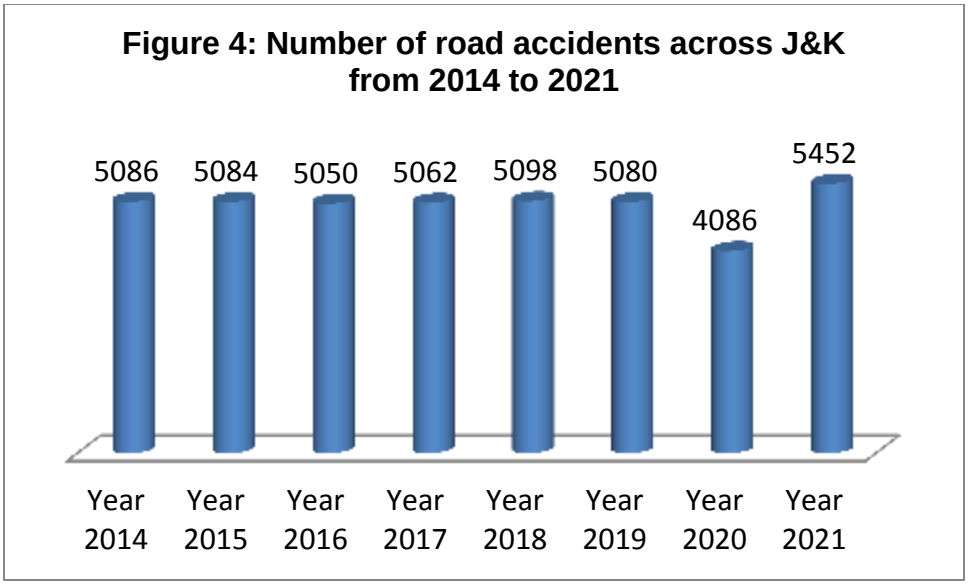
It has been reported that as many as 713 people lost their lives in Jammu and Kashmir in road accidents, a figure which is eight times more than those killed by bullets in the conflict ravaged region, official data reveals. The data compiled by the J&K Traffic Police Department, revealed that 5036 accidents happened in J&K from January to November in 2021, in which 713 persons were killed and 6447 were injured. We notice frequent traffic accidents and climate change is one cause of these accidents also.

The data shown in Figure 3, reveals that majority (58.5%) of the respondents were of the opinion that climate change resulted in increase of number of accidents. This is in agreement with the earlier studies and data available. The observations of our study coincides with the studies conducted across the globe based on real data (e.g., Islam, Alharthi and Alam; 2019).



The data shown in Figure 4, reveals that since 2014 maximum number of accidents in J&K were in last year, 2021. The killings due to accidents were more than killing due to militancy. There are number of factors responsible for increase in traffic accidents and climate change is one factor.

The rampant violation of traffic rules was also reported during the last two years. "In the year 2020, about 4.25 lakh violators were penalized for violating road safety norms, while this number of violators further climbed to six lakhs in year 2021", as per government reports. We can reduce impact on climate change by travelling less, creating less waste, recycle more and creat less trash.



DISCUSSION

In Kashmir during very wintery road conditions both in January and February but also in December, were the cause of an unusually high number of accidents as a result of slippery conditions on roads covered in snow and ice. The roads made slippery by rain as a contributory factor in accidents have shown a significant decline. The Road safety and accidents on Kashmir's roads depend on various factors of influence. It has been observed that apart from the existing infrastructure as well as the density and structure of traffic and the behaviour of road users, these also include the weather and prevailing weather patterns. Rain, snowfall as well as hailstones impact on roads, making for adverse driving conditions such as aquaplaning or slippery roads. Precipitation and fog reduce visibility results in the risk of accidents as usually chances of accident are more in the autumn and winter months than in spring and summer seasons. Besides climate, vulnerable roads, increase in public transport and encroachments of roads is other cause of accident in Kashmir. In view of climate change, it is expected that wintery hazards are expected to diminish in future whereas in spring, summer and autumn it is expected that greater heat and increased heavy rainfall might contribute to increasing the frequency of accidents. In some regions dust and sandstorms contributed to accidents in recent years. As the intensity of soil desiccation increases, such storms might occur more often in future.

CONCLUSION

Climate change has shocking impacts on every field worldwide and Jammu and Kashmir has also experienced due to effect of climate change by increasing temperature and erratic rainfall, flooding, erosion etc. It was noticed worldwide that climate change and traffic accidents were related. It has been noticed that due to climate change there is erratic rainfall; climate is getting warmer day by day due to increase in temperature, erosion, flooding incidents and natural disaster. The excessive rains and extreme variation in temperature has adversely affected every sphere of human life. Majority of respondents (72.5%) understudy were aware of climate change and believed that in last 20 years climate change showed its impact in every field of life. It was noticed that majority (58.5%) of respondents were of the opinion that climate change and number of accidents are associated. Since 2014 the number of accidents in J&K reported were above 5000 except in 2020 it was slightly less (4080) due to COVID-19 pandemic. The results of our study are in agreement with the earlier studies. Finally, current study suggested policy instruments to control accidents in the study area amidst changing climate. Infact, a number of

factors are responsible for increased number of traffic accidents and climate change can be considered as one factor. It is suggested that to reduce impact on climate change we should travel less, creating less waste, recycle more and creat less trash.

Acknowledgement

The authors thank all the respondents for taking keen interest in this study.

REFERENCES

1. Al-Reesi, H.; Ganguly, S.S.; Al-Adawi, S.; Laflamme, L.; Hasselberg, M.; Al-Maniri, A. Economic growth, motorization, and road traffic injuries in the Sultanate of Oman, 1985–2009. Traffic Inj. Prev. 2013, 14, 322–328.
2. Andersson, A.K.; Chapman, L. The impact of climate change on winter road maintenance and traffic accidents in West Midlands,UK. Accid. Anal. Prev. 2011, 43, 284–289.
3. Andrey, J.; Mills, B.; Leahy, M.; Suggett, J. Weather as a chronic hazard for road transportation in Canadian cities. Nat. Hazards2003, 28, 319–343.
4. Baker, C. A simplified analysis of various types of wind-induced road vehicle accidents. J. Wind Eng. Ind. Aerodyn. 1986, 22, 69–85.
5. Baker, C.; Reynolds, S. Wind-induced accidents of road vehicles. Accid. Anal. Prev. 1992, 24, 559–575.
6. Bergel-Hayat, R.; Debbarh, M.; Antoniou, C.; Yannis, G. Explaining the road accident risk: Weather effects. Accid. Anal. Prev. 2013,60, 456–465
7. Brodsky, H.; Hakkert, A.S. Risk of a road accident in rainy weather. Accid. Anal. Prev. 1988, 20, 161–176.
8. Chu, W.; Wu, C.; Atombo, C.; Zhang, H.; Özkan, T. Traffic climate, driver behaviour, and accidents involvement in China.Accid. Anal. Prev. 2019, 122, 119–126. [CrossRef]
9. Chu, W.; Wu, C.; Atombo, C.; Zhang, H.; Özkan, T. Traffic climate, driver behaviour, and accidents involvement in China.Accid. Anal. Prev. 2019, 122, 119126.
10. Chung, E.; Ohtani, O.; Warita, H.; Kuwahara, M.; Morita, H. Effect of rain on travel demand and traffic accidents. In Proceedingsof the 2005 IEEE Intelligent Transportation Systems, Vienna, Austria, 16 September 2005; pp. 1080–1083.
11. D. Eisenberg, K. WarnerEffects of snowfalls on motor vehicle accidents, injuries, and fatalitiesAm. J. Public Health, 95 (2005), pp. 120-124
12. Đorđević J (2004) Typology of physical - geographical factors in spatial planning. Geographical Institute "Jovan Cvijic" SANU, Belgrade (In Serbian)
13. Edwards, J.B. Wind-related road accidents in England and Wales 1980–1990. J. Wind Eng. Ind. Aerodyn. 1994, 52, 293–303.
14. Islam, M.; Alharthi, M.; Alam, M. The impacts of climate change on road traffic accidents in Saudi Arabia. Climate 2019, 7, 103.
15. J.B. EdwardsWeather-related road accidents in England and Wales: a spatial analysisJ. Transport. Geogr., 4 (1996), pp. 201-212
16. J.B. EdwardsWeather-related road accidents in England and Wales: a spatial analysisJ. Transport. Geogr., 4 (1996)
17. J.C. Andrey, B. Mills, M. Leahy, J. SuggettWeather as a chronic hazard for road transportation in Canadian citiesNat. Hazards, 28 (2003), pp. 319-343
18. Kaçan, B.; Fındık, G.; Üzümcüo ˘glu, Y.; Azık, D.; Solmazer, G.; Ersan, Ö.; Özkan, T.; Lajunen, T.; Öz, B.; Pashkevich, A. Driverprofiles based on values and traffic safety climate and their relationships with driver behaviors. Transp. Res. Part F Traffic Psychol.Behav. 2019, 64, 246–259.

19. Keay, K.; Simmonds, I. The association of rainfall and other weather variables with road traffic volume in Melbourne, Australia.Accid. Anal. Prev. 2005, 37, 109–124.
20. Law, T.H.; Noland, R.B.; Evans, A.W. The sources of the Kuznets relationship between road fatalities and economic growth. J. Transp. Geogr. 2011, 19, 355–365.
21. Lee, J.; Chae, J.; Yoon, T.; Yang, H. Traffic accident severity analysis with rain-related factors using structural equation modeling—A case study of Seoul City. Accid. Anal. Prev. 2018, 112, 1–10.
22. Löfgren S, Nilsson K, Johansson CM (2018) Considering landscape in strategic transport planning. Transp Res Part D: Transp Environ 65:396–408.
23. Lorenz H (1980) Designing and tracing of roads and highways. IRO Building Book, Belgrade (In Serbian)
24. Lovelace R (2021) Open source tools for geographic analysis in transport planning. J Geogr Syst. https://doi.org/10.1007/s10109-020-00342-2
25. Malin, F.; Norros, I.; Innamaa, S. Accident risk of road and weather conditions on different road types. Accid. Anal. Prev. 2019,122, 181–188.
26. Nofal, F.; Saeed, A. Seasonal variation and weather effects on road traffic accidents in Riyadh city. Public Health 1997, 111, 51–55.
27. Schlögl, M. A multivariate analysis of environmental effects on road accident occurrence using a balanced bagging approach.Accid. Anal. Prev. 2020, 136, 105398.
28. Sentić I, Đorđević J, Đorđević T (2018) The impact of climate elements on the road safety: Example of the highway route Belgrade-Novi Sad. III Serbian Road Congress, Belgrade 14-15.06.2018., pp. 414-423
29. Sentić I, Đorđević T (2019) Understanding physical environment through safe highway transport mobility with special review on climate - the highway route Belgrade-Novi Sad, Serbia. GeographicaPannonica 23(1):1–13.
30. Stern, E.; Zehavi, Y. Road safety and hot weather: A study in applied transport geography. Trans. Inst. Br. Geogr. 1990, 15, 102–111.
31. Wiebe, D.J.; Ray, S.; Maswabi, T.; Kgathi, C.; Branas, C.C. Economic development and road traffic fatalities in two neighbouring African nations. Afr. J. Emerg. Med. 2016, 6, 80–86.
32. Wu, C.Y.; Zaitchik, B.F.; Gohlke, J.M. Heat waves and fatal traffic crashes in the continental United States. Accid. Anal. Prev. 2018,119, 195–201.
33. Wu, Y.; Abdel-Aty, M.; Cai, Q.; Lee, J.; Park, J. Developing an algorithm to assess the rear-end collision risk under fog conditionsusing real-time data. Transp. Res. Part C Emerg. Technol. 2018, 87, 11–25.
34. Wu, Y.; Abdel-Aty, M.; Lee, J. Crash risk analysis during fog conditions using real-time traffic data. Accid. Anal. Prev. 2018, 114,4–11
35. Xing, F.; Huang, H.; Zhan, Z.; Zhai, X.; Ou, C.; Sze, N.N.; Hon, K.K. Hourly associations between weather factors and trafficcrashes: Non-linear and lag effects. Anal. Methods Accid. Res. 2019, 24, 100109.
36. Yusuff, M.A. Impact assessment of road traffic accidents on Nigerian economy. J. Res. Humanit. Soc. Sci. 2015, 3, 8–16.
37. Zhai, B.; Lu, J.; Wang, Y.; Wu, B. Real-time prediction of crash risk on freeways under fog conditions. Int. J. Transp. Sci. Technol.2020, 9, 287–298.
38. Zhan, Z.-Y.; Yu, Y.-M.; Chen, T.-T.; Xu, L.-J.; Ou, C.-Q. Effects of hourly precipitation and temperature on road traffic casualties inShenzhen, China (2010–2016): A time-stratified case-crossover study. Sci. Total Environ. 2020, 720, 137482.

CORRESPONDING AUTHOR

Dr. Bilal Ahmad Bhat, hails from Rainawari Srinagar Kashmir, J&K is presently working as Professor (Statistics) and Head, Division of Social Sciences, Faculty of Fisheries, Rangil Ganderbal, SKUAST-Kashmir J&K since August, 2018. Dr. Bilal Ahmad (Phd. Statistics, M.Sc. Mathematics, M.Sc. Statistics, Diploma in Foreign Language (French), CC, B.Ed.) Was earlier working in Mathematics & Statistics Dept University of Kashmir and in SKUAST-Jammu as Assistant Professor (Statistics) before joining SKUAST-Kashmir. He has participated and presented a number of research papers in various national/international conferences. He has published more than 250 research papers in various National/International Journals of repute and has published more than 400 popular articles. He has good knowledge of statistical softwares like SPSS, MINITAB, SAS, R and has guided a number of research scholars for their PhD programme. His field of research is probability theory, information theory and applied statistics. Dr. Bilal Ahmad is a member of advisory board in some well known National and International journals of repute.

CONTACT NO.: 9419185701, Email: bhat_bilal@rediffmail.com