Journal of Transport & Health ∎ (∎∎∎∎) ∎∎∎–∎∎∎

Contents lists available at ScienceDirect

Journal of Transport & Health

journal homepage: www.elsevier.com/locate/jth

Determinants of respiratory and cardiovascular health effects in traffic policemen: A perception-based comparative analysis

Nishitha Bajaj [a], Tanya Sharma [a], Dimpy Suneja [a], Suresh Jain [a,b,*], Prashant Kumar [c,d]

[a] Department of Natural Resources, TERI University, 10, Institutional Area, Vasant Kunj, New Delhi 110070, India
[b] Department of Energy and Environment, TERI University, 10, Institutional Area, Vasant Kunj, New Delhi 110070, India
[c] Department of Civil and Environmental Engineering, Faculty of Engineering and Physical Sciences, University of Surrey, Guildford GU2 7XH, United Kingdom
[d] Environmental Flow (EnFlo) Research Centre, Faculty of Engineering and Physical Sciences, University of Surrey, Guildford GU2 7XH, United Kingdom

ARTICLE INFO

Article history:
Received 13 June 2016
Received in revised form
9 December 2016
Accepted 12 December 2016

Keywords:
Traffic policemen vs. office workers
Prevalence rate
Relative Risk
Health survey
Health symptoms due to traffic-related air pollution

ABSTRACT

This study investigates the determining factors behind the adverse health effects of traffic policemen in the National Capital Territory (NCT) of Delhi. A comparative analysis between 532 traffic policemen (subject population) and 150 office workers (control group) was undertaken to study the prevalence of disease. A primary survey was conducted over a period of 6 months between July 2015 and February 2016 using a questionnaires a primary tool. A significantly higher ($p=0.005$) prevalence rate of respiratory and cardiovascular diseases was observed among traffic policemen than among the office workers (control group). Symptoms such as thick sputum, pain in joints and shortness of breath were prevalent in approximately 59%, 56% and 45% of subjects as compared to approximately 15%, 11% and 6% of the control population. The relative risk (RR) of developing respiratory and cardiovascular diseases was found to be significantly higher ($RR > 1$) for the traffic policemen than for the office workers. This is the first cross-sectional study to highlight the plight of traffic policemen in the NCT of Delhi. The influence of factors such as body mass index (BMI), age, habits (smoking and alcohol consumption) and service duration on disease prevalence was assessed among traffic policemen using statistical tests. The service duration was found to be the most important determinant compared with other influencing factors such as BMI and age, which significantly ($p=0.02$) affects the health of traffic policemen in the present study. A number of potential measures for improving the health conditions of traffic policemen are also discussed.

1. Introduction

Air pollution is a major global concern as it causes adverse effects on the environment and human health (Aggarwal and Jain, 2015; Carugno et al., 2016; Phung et al., 2016; Woodward and Levine, 2016; Jain and Khare, 2010). Numerous studies have reported an association between air pollution and increased rates of mortality and morbidity among the exposed populations (Kumar et al., 2011; Evans et al., 2012; Hamra et al., 2014; Aggarwal and Jain, 2015; Yorifuji et al., 2015; Nieuwenhuijsen et al., 2016; Woodward and Levine, 2016). Air pollution is ranked as one of the 10 major factors causing global health burden (Lim et al., 2012). Furthermore, it has also been estimated that ambient air pollution was responsible

* Corresponding author at: Department of Natural Resources, TERI University, 10, Institutional Area, Vasant Kunj, New Delhi 110070, India.
E-mail addresses: sureshjain_in@yahoo.com, sureshj@teri.res.in (S. Jain).

http://dx.doi.org/10.1016/j.jth.2016.12.003
2214-1405/

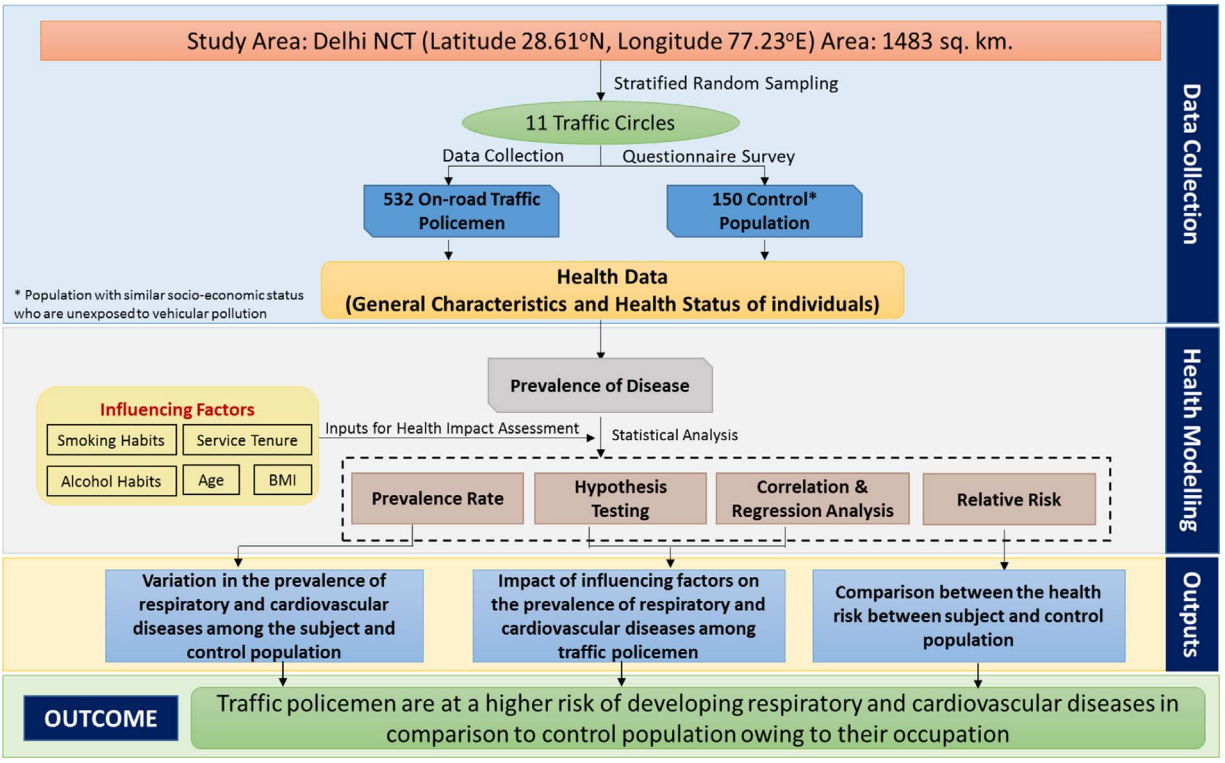

Fig. 1. Framework for health risk assessment of traffic policemen.

for over 3.7 million premature deaths globally in 2012 (WHO, 2014). In India, air pollution has been ranked as the fifth largest health risk that was responsible for nearly 620,000 deaths and 18 million healthy life years lost in 2010 A considerable increase in motorised vehicular density in urban areas worldwide can be considered a major cause for the increased concentration of air pollutants in the ambient environment (Kumar et al., 2014; Jain et al., 2016).

With a metropolitan population of 16.78 million in 2011, Delhi has been ranked as the second-most densely populated urban agglomeration in India (Census of India, 2011). The population of Delhi has experienced a shift in its travel preferences from public transport to majorly private transport, which is also reflected in a substantial increase in the number of registered vehicles in the city (Khanna et al., 2011; Jain et al., 2014, 2016; Nagpure et al., 2016). With a compound annual growth rate of 7.1% for the number of registered motor vehicles during 2002–2012, Delhi is ranked fifth among other Indian cities for having the largest number of registered motor vehicles. According to the Transport Department, Government of National Capital Territory (NCT) of Delhi, the total number of registered vehicles in the year 2013–2014 was nearly 8.82 million (GNCTD, 2014).

Because the road length in Delhi has not increased proportionately, the carrying capacity of the roads is at saturation level. This has led to road congestion and a decrease in the average travel speed (RITES, 2010). An increased shift to motorised personal vehicles, instead of using public transport, has significantly contributed to the increased concentration of air pollutants in the city (Sharma et al., 2013; Kumar et al., 2013, 2015; Aggarwal and Jain, 2015, 2016). The degradation of air quality in the city can be attributed to several factors such as an increase in vehicular density, construction sites, and roadside dust and biomass and refuse waste burning (Kumar et al., 2015).

The increasing levels of air pollutants are responsible for a higher incidence rate of cardiovascular and pulmonary diseases than previously noted in the city's history (Jain et al., 2015; Lim et al., 2012). Numerous studies have reported that both the long- and short-term exposures to air pollutants cause respiratory morbidity (Brunekreef and Holgate, 2002; Gauderman et al., 2007; Anderson et al., 2012; Hoek et al., 2013; WHO, 2013; Feng et al., 2016; Phung et al., 2016; Zhang et al., 2016). Vehicular emissions are attributed to be one of the major factors for elevated air pollutant levels as they exhibit small-scale spatial variation with high accumulation in a confined area (Sharma et al., 2013; Kumar et al., 2013, 2014). Thus, vehicular emissions are a potential threat to the road users and people who are in proximity to the roads. Road users such as pedestrians and cyclists are exposed to a relatively higher concentration of air pollutants than individuals working in closed environments (Hoek et al., 2002; Zuurbier et al., 2011; Goel and Kumar, 2015, 2016). One such group is the traffic policemen who, because of the nature of their occupation, spend approximately 8–10 h near roads and road intersections. Numerous studies have found that the health of traffic policemen deteriorates with time during their service periods (Ahlawat and Shukla, 2010; Pal et al., 2010; Pramila and Girija, 2013). Past work has also reported that traffic policemen are likely to have a

Please cite this article as: Bajaj, N., et al., Determinants of respiratory and cardiovascular health effects in traffic policemen: A perception-based comparative analysis. Journal of Transport & Health (2017), http://dx.doi.org/10.1016/j.jth.2016.12.003