Association between socioeconomic status and influenza-like illness: A study from Western part of India

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ABSTRACT

Objectives: Health status is associated with socioeconomic status (SES) of the individuals. The aim of this study was to identify any link between the SES and influenza-like illness (ILI). Materials and Methods: This observational case-control study was done on 18–70 years old patients presented with ILI (cases) at tertiary care hospital of western India. Controls were selected from demographically matched elective surgery patients except the SES. SES was evaluated as per the Modified B G Prasad 2017 scale and participants were further classified in lower SES (per capita income <2000 INR) and non-lower SES groups. Results: 810 cases and 830 controls were compared. Many cases were from lower SES, had poor hand hygiene, and were using soil, mud, ash (SMA) for hand cleaning as compared to the control. Among the cases significant numbers were from lower SES (543/810 [67%], P < 0.02), many were alcoholics, smokers, had poor hand hygiene, were using SMA for hand cleaning, and had preexisting chronic obstructive pulmonary disease (COPD), while few were having diabetes in the lower SES group as compared to the non-lower SES group. ILI was more common among lower SES class in unadjusted analysis (odds ratio [OR] 1.58, 95% CI 0.89–2.76) and the results were significant even after the adjustment of covariates (OR 1.62, 95% CI, 0.94–2.85). Conclusion: Lower SES people were 2.8 times more prone to ILI as compared to the age- and sex-matched control in western part of India.

Keywords: Hand hygiene, influenza, influenza-like illness, Soil, mud and ash (SMA) for hand cleaning agents, socioeconomic status, swine flu

Introduction

Seasonal influenza viruses are of four types A, B, C, and D, of which A and B subtypes can circulate in the environment and cause seasonal epidemics.¹ In tropical countries like India, influenza may occur throughout the year in the form of irregular outbreaks unlike in cold climate countries where its epidemics are in winter seasons only.² These respiratory viruses are transmitted through either air (infected cough droplets) or by direct contact with the contaminated surfaces. These viruses

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remain alive in the environment up to 72 hours.\textsuperscript{[1,2]} The first influenza-A virus H1N1 (swine flu) strain pandemic occurred in 1918 and it again reemerged in 2009.\textsuperscript{[3,4]} After this many seasonal pandemics of influenza-A virus with many different strains have been reported from India as well as globally.\textsuperscript{[1,3]} Influenza may present as mild upper respiratory tract infection to severe lower respiratory tract infections with secondary bacterial infections including deaths.\textsuperscript{[3]} ILI category A and B are mild and moderate forms of the disease vulnerability.\textsuperscript{[1,4]} In both these categories, traditional treatment and home isolation are recommended without microbiological confirmation of the diagnosis.\textsuperscript{[3,4]} Category C is a severe form of the illness and it requires hospitalization along with microbiological diagnostic tests.\textsuperscript{[4]} Respiratory tract infections caused by other than influenza viruses such as rhinovirus, respiratory syncytial virus, and adenoviruses also present with same clinical features and are difficult to differentiate from influenza.\textsuperscript{[4,5]} These respiratory viral infections are collectively defined as influenza-like illness (ILI).\textsuperscript{[2,4,5]} The ILI is widely used terminology for epidemiological study of influenza worldwide.\textsuperscript{[6]}

Socioeconomic status (SES) is an important determinant of the health status of the citizen in any country.\textsuperscript{[4]} It is a composite index measured by occupation, education, and per capita income of a person.\textsuperscript{[6,7]} These three measures of SES play role in preventive and therapeutic strategies of many diseases in the community either individually or in combinations.\textsuperscript{[7,8]} Income reflects expenditure power, residential locality, diet, and access to medical care; occupation determines social status, physical activities, social responsibilities, and work-related health issues; and education indicates problem-solving capabilities, personality, psychosocial status, and financial resources.\textsuperscript{[8]} The most commonly used SES scales in India are modified BG Prasad scale, Kuppuswamy scale, and Uday Pareek scale for both urban and rural areas, urban areas, and rural areas, respectively.\textsuperscript{[9]} Association between SES and noncommunicable diseases has been studied extensively, but very few studies have been conducted for communicable diseases till date.\textsuperscript{[7,10,11]}

ILI can be prevented with chemoprophylaxis, vaccination, and proper hand hygiene.\textsuperscript{[12-14]} However, all these preventive measures are either difficult to implement or out of reach for the community of lower SES because of lower per capita income.\textsuperscript{[8]} Patients suffering from ILI many a time first approaches to family physicians or primary health center with initial impression of simple cough and cold illness.\textsuperscript{[8,9]} As per our knowledge, no previous studies have been conducted to study link between the ILI and SES in India. Aims of this study were to identify any link between the SES and ILI along with demographic and clinical features of the diseases.

**Material and Methods**

This case–control observational, prospective study was conducted at Zydus Medical College and Hospital, Dahod, India. Before the initiation of recruitment of subjects, the protocol of research project was approved by the Institutional Ethics Committee. This is tertiary care health center located in the northern region of Gujarat which is in close vicinity of the states of Rajasthan and Madhya Pradesh. All the potential patients of age between 18 and 70 years presented with clinical diagnosis of ILI of all categories as per the Indian ILI 2015 guidelines were included in the study. Control subjects were selected from age-and gender-matched patients subjected to elective surgeries during the study period. Detail history, clinical examination, and appropriate investigations were performed and further treatment was planned accordingly. Written consent from every participant was obtained for publications of the data with preservation of human rights as per the Declaration of Helsinki, World Medical Association 2014 and biomedical journals publications guidelines.

SES was calculated as lower, lower middle, upper-middle, and upper class as per the Modified B G Prasad 2017 scale in both the groups. Patients of lower class and lower middle class (per capita income less than 2000 INR) were classified as lower SES and rest of the patients were classified as non-lower SES in both the groups. We have selected BG Prasad scale because it is applicable in rural as well as urban populations. Personal history of hand hygiene such as handwashing frequencies, duration, methods; and use of cleaning agents for cleaning hands were evaluated for all the participants. SES and hand hygiene details were evaluated as per the prepared interview questionnaires. Proper hand hygiene was defined as washing the hands with soap or antiseptics for at least 20 seconds after using toilets, before preparation or intake of food, and entering home from the workplace. Among hospitalized cases of category-C ILI, whose throat swab for H1N1 influenza came negative were excluded from the study. All the subjects from the case as well as the control groups who did not agree to sign the consent form were also excluded from the study.

Epi Info\textsuperscript{TM} Web Survey Version 1.6 software was used to analyze the data recorded in mean and percentages. Student $t$-test with paired $P$ value was used for comparison of continuous variables and Chi-square test for categorical differences between the groups.

**Results**

830 cases and an equal number of controls were enrolled in the study. Among cases, ILI categories A, B1, B2, and C numbers were 410 (49.40%), 190 (22.89%), 150 (18.07%), and 80 (9.64%), respectively. After 24 hours 20 out of 80 ILI category C patients were having negative throat swab for H1N1 and they were excluded from the study. Finally, 810 subjects in the case and 830 in the control group completed the study. Patients of lower SES having history of COPD and diabetes mellitus patients of higher SES were more affected by ILI as compared to the control. A significant number of ILI patients reported poor hand hygiene as compared to the control. It was also noticed that many patients were using Soil, Mud and Ash (SMA) instead of soap for cleaning the hands in both the groups, but more in the case
group. However, history of hypertension, alcohol consumption, or smoking was found invariably in both the groups but there was no concrete correlation.[Table 1].

The higher number of cases (543/810 patients) were reported from the lower SES group as compared with the non-lower SES (267/810 patients) of ILI group (P < 0.0004). It was noticed that habit of alcohol consumption, smoking, poor hand hygiene, and SMA use for hands cleaning were more common in lower SES patients as compared to the non-lower SES group. Preexisting COPD patients were more, while diabetics were lesser as a comorbid medical illness in lower SES as compared to the non-lower SES group in the cases [Table 1].

In unadjusted analysis [Table 2], a more significant number of patients were from the lower SES class as compared with the control group (odds ratio [OR] 2.80 [1.58–4.99]). The difference was persisted after multiple covariate adjustments like gender, alcohol consumption, smoking and pre-existing COPD, hypertension, and diabetes (OR 2.82 [1.94–5.15]). Improper hand hygiene and the use of SMA for hand cleaning were also significant risk factors of ILI in adjusted as well as unadjusted analysis.

**Discussion**

In this study, lower SES patients were 2.8 times more affected by ILI irrespective of age and sex. Almost half of the cases were of category-A (mild) and one-tenth cases were of severe variety category-C ILI in this study. Poor hand hygiene and the use of SMA as hand cleaning agents were identified as significant risk factors associated with the illness. However, they were more prominent in the lower SES group.

As per WHO guidelines, hands should be rinsed with water and soap or antiseptics for at least 20 seconds with interlocking of fingers and cleaning all the surfaces of the hands and wrists, after every toilet visit, before consuming or preparing food, returning from workplace to the home, or touching contaminated surfaces.

**Table 1:** Demographic and clinical features of the case group (influenza-like illness) versus control group (elective surgeries) and lower SES versus non-lower SES

| Features | ILI (n=810) | ES (n=830) | P value | L-SES (n=543) | NL-SES (n=267) | P value |
|----------|-------------|-------------|---------|--------------|----------------|---------|
| Age      | 42±14.16    | 44±15.28    | 0.78    | 40±13.56     | 42±14.34       | 0.72    |
| Female (%)| 42          | 38          | 0.56    | 45           | 48             | 0.30    |
| Lower SES (%)| 67        | 42          | 0.0004  | --           | --             | --      |
| PHH (%) | 12          | 30          | 0.001   | 10           | 28             | 0.002   |
| SMA (%) | 20          | 08          | 0.02    | 24           | 12             | 0.03    |
| DM (%)  | 07          | 03          | 0.77    | 03           | 08             | 0.12    |
| COPD (%)| 06          | 03          | 0.31    | 08           | 05             | 0.79    |
| Alcoholic (%)| 11        | 13          | 0.66    | 21           | 11             | 0.06    |
| Smoke (%)| 14          | 12          | 0.67    | 17           | 10             | 0.15    |
our study results. The second limitation is the use of only B G B G Prasad scale for classification of SES and it includes only per capita income, while ideal SES should represent occupation, education, and family income together for SES calculations. The third limitation is, we have excluded microbiologically negative category C cases and minimum ILI patients are from this category. The reason for exclusion was many bacterial, fungal, and allergic upper respiratory tract inflammations may mimic ILI category C. However, it is possible that some non-ILI illnesses patients may have clinical pictures like category A and B and they may have been included in our study.

Conclusion

The lower SES class (Per capita income < 2000 INR) was significantly affected by the ILI as compared to the higher SES. Poor hand hygiene and use of SMA for cleaning hands were significant risk factors apart from the lower SES for this illness. Considering risk and health hazards of ILI, intensive preventive measures are needed at primary health care level to deliver better wellbeing of lower SES people and the prevention of the ILI.

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Ethical approval

The study was approved by Zydus Medical College and Hospital ethical committee, Dahod, India. REF number ZMCH/IEC/2018-19/004 dated 26 April 2019.

Animals used and human rights

No animals were used in the study and human rights were preserved.

Consent of participants

Written consent for participation in the study as well as for the publication of data was taken from individual participants.

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Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Gong YN, Kuo RL, Chen GW, Shih SR. Centennial review of influenza in Taiwan. Biomed J 2018;41:234-41.
2. Neumann G, Kawaoka Y. The first influenza pandemic of the new millennium. Influenza Other Respir Viruses 2011;5:157-66.
3. Brockwell-Staats C, Webster RG, Webby RJ. Diversity of influenza viruses in swine and the emergence of a novel human pandemic influenza A (H1N1). Influenza Other Respir Viruses 2009;3:207-13.
4. Adam K, Pangesti KN, Setiawaty V. Multiple viral infections detected from influenza-like illness cases in Indonesia. Biomed Res Int 2017:9541619. doi: 10.1155/2017/9541619.
5. Thomas RE. Is influenza-like illness a useful concept and an appropriate test of influenza vaccine effectiveness? Vaccine 2014;32:2143-9.
6. Darin-Mattsson A, Fors S, Käreholt I. Different indicators of socioeconomic status and their relative importance as determinants of health in old age. Int J Equity Health 2017;16:173.
7. Winkleby MA, Jatulis DE, Frank E, Fortmann SP. Socioeconomic status and health: How education, income, and occupation contribute to risk factors for cardiovascular disease. Am J Public Health 1992;82:816-20.
8. Creswell J, Raviglione M, Ottmani S, Migliori GB, Uplekar M, Blanc L, et al. Tuberculosis and noncommunicable diseases: Neglected links and missed opportunities. Eur Respir J 2011;37:1269-82.
9. Singh T, Sharma S, Nagesh S. Socio-economic status scales updated for 2017. Int J Res Med Sci 2017;5:3264-7.
10. Lago S, Cantarero D, Rivera B, Pascual M, Blázquez-Fernández C, Casal B, et al. Socioeconomic status, health inequalities and non-communicable diseases: A systematic review. J Public Health 2018;26:1-14.
11. Biswas T, Townsend N, Islam MS, Islam MR, Das Gupta R, Das SK, et al. Association between socioeconomic status and prevalence of non-communicable diseases risk factors and comorbidities in Bangladesh: Findings from a nationwide cross-sectional survey. BMJ Open 2019;9:e025538.
12. National Treatment Guidelines for Seasonal Influenza (Sentinel Hospitals for H1N1). Edited at DHS (HQ)-2015. New Delhi: Directorate of Health Services; 2015.
13. Lucyk K, Simmonds KA, Lorenzetti DL, Drews SJ, Svenson LW, Russell ML. The association between influenza vaccination and socioeconomic status in high income countries varies by the measure used: A systematic review. BMC Med Res Methodol 2019;19:153.
14. Influenza vaccination in patients with high blood pressure is associated with an 18% reduced risk of death during flu season, according to research presented today at ESC Congress 2019 together with the World Congress of Cardiology.

Table 2: Logistic regression results: lower SES prognosticators

| Covariate                        | Unadjusted O.R. (95% C.I.) | Adjusted O.R. (95% C.I.) |
|----------------------------------|-----------------------------|--------------------------|
| Female Gender                    | 1.18 (0.67-2.08)            | Insignificant            |
| Lower SES                        | 2.80 (1.58-4.99)            | 2.82 (1.94-5.15)         |
| Hypertension                     | 0.80 (0.32-2.02)            | Insignificant            |
| Diabetes Mellitus                | 1.18 (0.38-3.64)            | Insignificant            |
| COPD                             | 2.06 (0.50-8.49)            | Insignificant            |
| Proper hand hygiene              | 0.32 (0.15-0.67)            | 0.34 (0.18-0.77)         |
| SMA for hand cleaning            | 2.87 (1.20-6.88)            | 2.88 (1.26-6.96)         |
| Alcoholic                        | 0.83 (0.35-1.95)            | Insignificant            |
| Smoker                           | 1.19 (0.52-2.73)            | Insignificant            |

Abbreviations: ES: Elective surgeries (control group); PHH: proper hand hygiene; L-SES and NL-SES: Lower and non-lower socioeconomic status; COPD: Chronic obstructive pulmonary disease; SMA: Soil, mud, ash for hand cleaning.
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15. Rabbi, Sifat E, Dey, Nepal C. Exploring the gap between hand washing knowledge and practices in Bangladesh: A cross-sectional comparative study. BMC Public Health 2013;13:89.

16. Buchwald AG, Tamboura B, Tennant SM, Haidara FC, Coulibaly F, Doumbia M, et al. Epidemiology, risk factors, and outcomes of respiratory syncytial virus infections in Newborns in Bamako, Mali. Clin Infect Dis 2019;cid157. doi: 10.1093/cid/ciz157.

17. Mishra P, Fareed N, Battur H, Khanagar S. Effectiveness of an integrated handwash and mouthrinse programme on general health of young adolescent school children: A randomized controlled trial. J Indian Assoc Public Health Dent 2018;16:116-21.

18. Peltzer K, Pengpid S. Oral and hand hygiene behaviour and risk factors among in-school adolescents in four Southeast Asian countries. Int J Environ Res Public Health 2014;11:2780-2792.

19. Liu M, Ou J, Zhang L, Shen X, Hong R, Ma H, et al. Protective effect of hand-washing and good hygienic habits against seasonal influenza: A case-control study. Medicine 2016;95:e3046.

20. Jumaa PA. Hand hygiene: Simple and complex. Int J Infect Dis 2005;9:3-14.

21. Pittet D. Hand hygiene: From research to action. J Infect Prev 2017;18:100-2.

22. Willmott M, Nicholson A, Busse H, MacArthur GJ, Brookes S, Campbell R. Effectiveness of hand hygiene interventions in reducing illness absence among children in educational settings: A systematic review and meta-analysis. Arch Dis Child 2016;101:42-50.

23. Aiello A, Coulborn R, Perez V, Larson EL. Effect of hand hygiene on infectious disease risk in the community setting: A meta-analysis. Am J Public Health 2008;98:1372-81.

24. Moncion K, Young K, Tunis M, Rempel S, Stirling R, Zhao, L. Effectiveness of hand hygiene practices in preventing influenza virus infection in the community setting: A systematic review. Can Commun Dis Rep 2019;45:12-23.

25. Joshi A, Amadi C. Impact of water, sanitation, and hygiene interventions on improving health outcomes among school children. J Environ Public Health 2013;2013:984626. doi: 10.1155/2013/984626.

26. Jasper C, Le TT, Bartram J. Water and sanitation in schools: A systematic review of the health and educational outcomes. Int J Environ Res Public Health 2012;9:2772-87.

27. Mathur P. Hand hygiene: Back to the basics of infection control. Indian J Med Res 2011;134:611-20.

28. Warren-Gash C, Fragaszy E, Hayward AC. Hand hygiene to reduce community transmission of influenza and acute respiratory tract infection: A systematic review. Influenza Other Respir Viruses 2013;7:738-49.

29. Hoque BA. Hand washing practices and challenges in Bangladesh. Int J Environ Res Public Health 2003;13(Suppl 1):S81-7.

30. Rose TC, Adams NL, Barr B, Hawker J, O'Brien SJ, Violato M, et al. Socioeconomic status is associated with symptom severity and sickness absence in people with infectious intestinal disease in the UK. BMC Infect Dis 2017;17:447.

31. Thrane N, Søndergaard C, Schönheyder HC, Sørensen HT. Socioeconomic factors and risk of hospitalization with infectious diseases in 0- to 2-year-old Danish children. Eur J Epidemiol 2005;20:467-74.

32. Raihan MJ, Farzana FD, Sultana S, Haque MA, Rahman AS, Waid JL, et al. Examining the relationship between socioeconomic status, WASH practices and wasting. PLoS One 2017;12:e0172134.