



Determinants of the Use of Personal Protective Equipment: A Literature Review

**Michelle K. James^{a*}, Chauncey A. Ogle-Mustafa^a
and Melody A. Chichester^a**

^a *School of Allied Health, Environment Health, College of Medical Sciences University of Guyana,
Georgetown, Guyana.*

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JESBS/2023/v36i21205

Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://www.sdiarticle5.com/review-history/95503>

Systematic Review

Received: 25/10/2022

Accepted: 29/12/2022

Published: 27/01/2023

ABSTRACT

Workers are exposed to many types of hazards daily, depending on their work type. Therefore, employers should ensure that their employees are trained on their workplace hazards, identify the threat, and provide them with the tools to prevent and control their exposure to risks. This study aims to identify the determinants of Personal Protective Equipment (PPE) use.

Methodology: A systematic search was performed using various Electronic databases such as PubMed, Science Direct, Peer review Journal, Research gate, and others. We included original studies that evaluated the effect of several determinants on PPE use. In addition, free full-text studies published in English from 2010 – to 2020 were also included. A total of fourteen studies met all the criteria and were selected to be included in this review.

Results: Findings revealed that workers across the board in various disciplines are often without PPE gear for multiple reasons. These include discomfort, unavailability at work, to affordability.

*Corresponding author: E-mail: michelle.james@uog.edu.gy;

Other factors include a lack of knowledge of the use, importance, and lack of company policy enforcement.

Conclusion: The main determinants found to affect PPE use in organizations can be organized into three categories: Individual factors, such as knowledge, beliefs, attitudes, and socio-demographics; Environmental factors, such as equipment availability; and Organizational factors, such as management's expectations, and workplace policies.

Keywords: *Barriers and determinants of use; personal protective equipment; international labor laws for PPE; centers for disease control and PPE; reasons for PPE; safety health act; guide to personal protective equipment.*

ACRONYMS

ASSE : American Society of Safety Engineers
CDC : Centers for Disease Control
ILO : International Labor Organization
IOM : Institute of Medicine
OSHA : Occupational Safety and Health Act
PPE : Personal Protective Equipment
WHO : World Health Organization

1. INTRODUCTION

All workers have been exposed to many types of hazards daily depending on their type of work, and the duration of the tasks. These hazards may be physical, biological, chemical, ergonomic, and even psychological [1]. Centers for Disease Control states that to reduce or eliminate the risks workers face, employers should ensure that their employees are trained on their workplace hazards, able to identify the hazard, and provided with the tools for preventing and controlling their exposure [2].

“The International Labor Organization (ILO), SUBSIDIARY LEGISLATION 424.21 of 2003, defines Personal Protective Equipment (PPE) as all equipment designed to be worn or held by the worker to protect him/her against one or more hazards that are likely to endanger his health and safety at work” [3].

“Personal protective equipment (PPE) such as hard hats, goggles, gloves, and boots play a vital role in the prevention of health hazards and promotion of Safety. It is concluded that many scientific data show most of the workers suffering injury were not wearing these types of clothing” [4].

Ward [5] a survey, revealed that “nearly all of the safety professionals interviewed said that workers in their organizations had at some point failed to wear the necessary safety equipment while on the job”. Ward further elaborated that 98% of respondents surveyed by Kimberly-Clark

Professional who attended the American Society of Safety Engineers (ASSE) answered “yes” when asked if they had observed workers not wearing safety equipment when they were required to wear these gear. Another survey revealed that 29% of respondents said that non-compliance with wearing PPE had happened on numerous occasions [6].

“Previous studies from the US Department of Labor in a (2020) report, revealed that out of 4,779 worker fatalities in private industry in 2018, 1,008 (21.1%) were in construction — that is, one in five worker deaths last year were in construction” [7].

It is noted that in the Caribbean, there is little or no documentation on research on exposure to and risks from occupational hazards [8].

Kowlessar [9] revealed that “during the period 2006 to 2015, there were a total of 102 fatal accidents which occurred in various workplaces across Trinidad. She further noted that the construction industry was cited to have the highest number of fatalities, and it recorded 33 (32.4%) fatal accidents for that period”. Guyana Labor Forces Survey [10] estimates that the total labor force in Guyana is approximately three hundred eighteen thousand four hundred ninety-eight (318 498) persons, who are aged fifteen (15) years and older.

The Minister of Labor, Mr. Keith Scott 2018, while addressing his audience announced that “There was a total of 560 reported workplace accidents of which 22 (4%) have resulted in the loss of lives during 2018.” His remarks were validated by a number of recent cases. For example, In March 2019, a manganese company was ordered to halt exploration since eight (8) Chinese workers fell ill, with two tests positive for Leptospirosis (“Manganese company ordered to halt exploration”, 2019). Later, in June, a technician and a driver were electrocuted and

two others were injured during the installation of surveillance cameras at the northern side of the Guyana National Stadium [11].

Given the frequency in occurrence of industrial accidents, the principles of occupational health and safety should become even more vital given that Guyana is now an oil-producing nation. This statement was echoed in a press conference by Dr. Karen Cummings according to the news reporter. Further, the health and safety regulations in the workplace are of utmost importance to the well-being of the employee and the employer because a safe and healthy workplace is conducive to workers' safety [12]. These incidents cry for the need to provide and ensure the use of PPE in the workplace. One too many have lost their lives carelessly and can be avoided if basic steps are taken for the implementation of PPE in workplaces in Guyana.

The background data suggests that very little information exists regarding worker health hazards and how they are controlled in developing countries. There is limited information on the use of personal protective equipment or work-related health problems within the various occupational groups. This issue of PPE is evident in the country of Guyana since little information is published concerning these problems, even though the number of small-scale enterprises continues to increase. For this need, the researchers aim to gather information with a Systematic Review of the determinants of the use of personal protective equipment (PPE).

1.1 Problem Statement

Labor Laws worldwide require that workers wear protective devices and clothing provided by the employer and report to their employer any absence of or defect in any protective device. However, data proves that this may not necessarily be the case due to the high incidence of workplace injuries and deaths [13]. As such, the researchers decided to execute a Systematic Review to ascertain where the problem lies and why workers have not been using Personal Protective Equipment (PPE) as mandated. This research will ascertain what are the determinants influencing Personal Protective Equipment (PPE) use, using the systematic review approach.

1.2 Objective of the Study

This study aims to use a Systematic Review Approach to compile the determinants of

Personal Protective Equipment (PPE) use in the work environment with a significant incidence of potential hazards such as the construction, medical, automobile, and agricultural fields.

1.3 Specific Objectives

To achieve the broad objective, in this Systematic Review, the following specific objective will be pursued

- To identify if there are determinants that transcend the boundaries of the various fields of work.
- To determine if there is a specific field that is more likely to be errant in following PPE guidelines.

1.4 Significance of the Study

It is evident that Personal Protective Equipment (PPE) is essential for a healthy workforce in a conducive environment. The lack of compliance can result in deaths or injuries. The evidence provide, supports the notion that PPE must be provided and worn by all employees.

The findings of this study will play a key role in raising awareness of the use of Personal Protective Equipment and will also foster the development of strategies and regulations to combat the various determinants of PPE use.

2. METHODOLOGY

This Systematic Review commences with the development of the question: What are the determinants that dictate if workers wear or refuse to wear PPE? Keywords phrases used in the article search included "Personal Protective Equipment", "Barriers", and "Determinants of Use". Electronic databases such as PUBMED, MEDLINE, Cochrane, Science Direct, PROSPERO, and Google Scholar were utilized from January to August 2020 to source articles related to the topic.

Eligibility criteria for this study included original studies completed within the prerequisite time frame of 10 years (2010 - 2020) on the use of Personal Protective Equipment reported in English. Free Full-text was also included. The criteria were expanded to include studies on specific fields such as Medical, Agricultural, Construction, etc. Exclusion criteria included: articles without a full text, paid articles, and studies conducted more than 10 years ago.

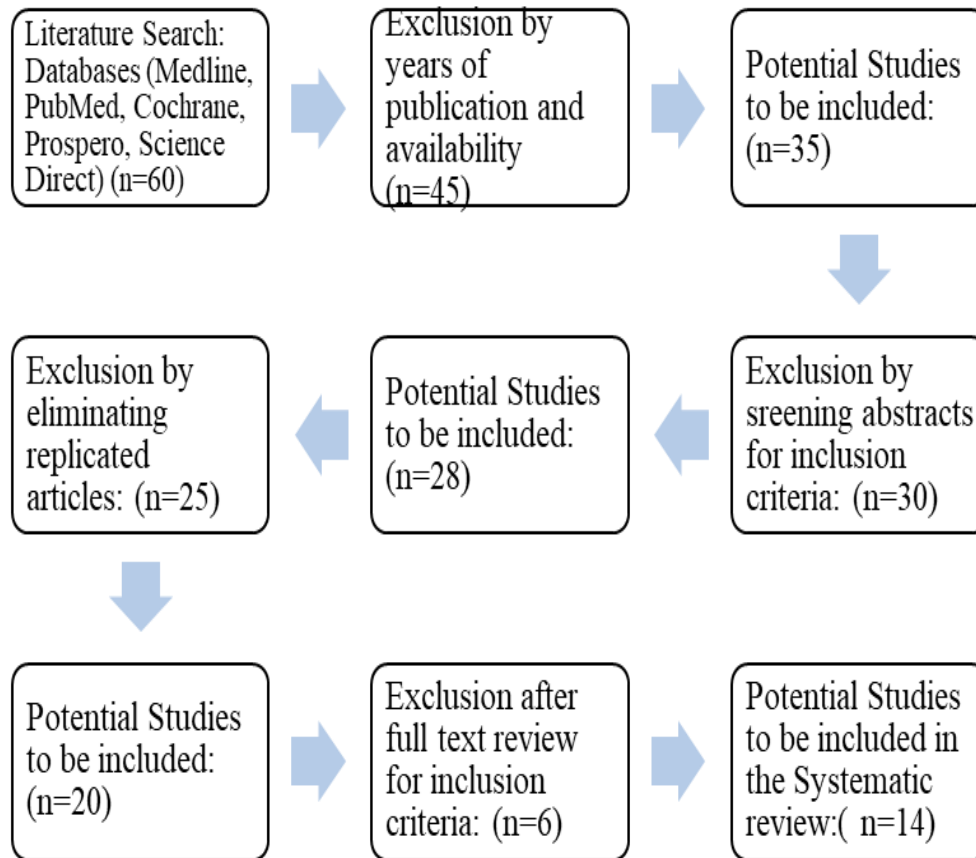


Chart 1. Flowchart of Study Selection

The Authors then reviewed the full texts to ascertain their applicability to the topic. After title and abstract screening, a comprehensive table summarizing the findings of each eligible article was developed to allow for ease of data handling and organization. A total of fourteen studies met all the criteria and were selected to be included in the results of this systematic review.

3. RESULTS

Characteristics and outcomes of articles included in the systematic review reveal the following.

In a cross-sectional study conducted in Thailand with 330 chili-growing farmers, [14] found that most of the respondents demonstrated a low level of knowledge regarding PPE and pesticide use, while others were not concerned about it, but demonstrated a fair level of practice in terms of using PPE. In another cross-sectional study in Nepal titled Utilization Pattern of Personal Protective Equipment among Industrial Workers of Nawalparasi, a sample of 187 workers in five industries (Beer, Rio, Chesseball, Chips, and

Wafer) was investigated. Findings revealed that the main reasons for not using PPE were the unavailability of PPE (33.3%) and the necessity of using PPE (66.7%) [15]. A study titled Occupational Health and Safety Management: The Use of Personal Protective Equipment (PPE) by Artisans in The Local Automotive Industry in Volta Region, Ghana investigated 200 randomly selected artisans. It was found that the key reasons given by most respondents for not using PPE were the non-availability of equipment, the PPEs were not designed for hot weather, and the equipment was too heavy causing Inconvenience [16]. In a quantitative study, [17] used 235 manicurists in a study conducted in Brazil. Findings revealed poor knowledge of and adherence to PPE use. [18] a cross-sectional study in Occupational Hazards and Use of Personal Protective Equipment among Small Scale Welders in Lusaka, Zambia investigated 430 small-scale welders and discovered that education awareness was paramount to the hazards coupled with the use of PPE. A similar study quantitative study [19] used 100 cement factory workers in Nepal to examine the

knowledge and practice related to occupational hazards among Maruti Cement Factory workers and found the variables having a significant influx in the knowledge and the practice of workers about occupational hazards, receiving information about the job-associated hazards, and attending training course about occupational health and safety. A cross-sectional study with 511 health workers [20] postulated that the commonest inhibiting factors to the use of PPEs even when available were the perception of low risk to hazard, forgetfulness, and disturbance with work activity (74.0%, 39.9%, and 22.5% respectively. Muema [21] another cross-sectional study with 104 construction workers from Kenya, found that among the participants 45 % were using the right PPE. More than half of the workers did not have any Personal Protective Equipment (PPEs), even though about 76.0% of participants had not been trained on PPE use or any other safety training. Powers et al. [22] in a study on factors influencing nurse compliance with standard precautions, of 231 registered nurses, findings revealed that fewer than one-fifth (17.4%) of respondents reported compliance with all 9 SP items. There was a significant relationship between susceptibility to CV and compliance and between barriers to SP use and compliance. Another qualitative and quantitative (mixed) method study of 80 motor vehicle repair workers reveals that unavailability, discomfort during use, decreased work speed, expensive, to conform/fit in, and work does not require PPE use [23]. Poor-fitting and PPE, frequent stock-outs, inadequate PPE as well as lack of training in PPE use, were revealed by Okello [24] in a cross-sectional study with 65 respondents, of which 6 of the respondents were deemed invalidated, thus, concluding only 59 of these health workers' responses in Uganda to be valuable. Further to this finding, [25] a similar qualitative study of 102 workers from 28 small-scale industries in Saudi Arabia, discovered from the survey that policies and measures for the delivery of OSH services are limited and deficient for the studied population. Even though the laws, regulations, and policies are in place; their implementation, inspection, and audits for proper adherence to standards are needed to be improved in the studied workshops. Asgedom [26], a cross-sectional study of Ethiopia, with 159 particleboard factory workers, and 13 management personnel were investigated on their Knowledge, attitude, and practice related to chemical hazards and personal protective equipment among particleboard workers. The reasons given for not using any type of PPE

were reported to be lack of access (59%), lack of knowledge of its importance (33%), not comfortable (3.9%), not useful (1.9%), and 1.9% said that PPE was easily damaged. Wright [27] a mixed study of the qualitative and quantitative data of 272 wastewater workers in the Southeast Region of the United States, revealed that some of the reasons for not using PPE are discomfort, interference with the ability to do the job, unavailability of PPE, coworkers making fun of PPE user, supervisor seldom wears PPE when required, and it is too inconvenient. These factors taken lightly have altered the lives of many individuals and homes through death, disabilities, and other social and economic issues. Despite efforts made to curb the effects of exposure to occupational noise, individual perception and behavior still pose a challenge. As such, in contemporary survey with variables to the issue of noise exposure was implemented on a sample of 278 industrial workers with a sound pressure level of 80 dB (A). Findings revealed a number of direct and indirect variables that influence the behaviors of the participants and the outcome of the investigation. These include personal ethical traits such as values, morals, and environmental perception in relation to environmental education. "Thus, the perception of noise exposure risk by workers is an important predictor of the use of hearing protection equipment" p. 1 [28]. Therefore, it is imperative that PPE be made mandatory where needed and consequences must be implemented for the violation of laws and policies in this matter.

After reviewing a number of databases including Cochrane and PROSPERO, four were selected for use because they were appropriate for conducting this systematic review. These databases are Research Gate, PubMed, Semantic Scholar, and Google Scholar. A total of 14 articles were accepted for the systematic review out of the initial identification of 60 possible studies from the databases aforementioned. Research Gate is a professional network for scientists and researchers. Over 17 million persons from around the world use it to share, discover, and discuss research. It is guided by the mission to connect the world of science and make research open to all. A Research Gate search showed a list of publications with the corresponding authors and dates. The result of a Keyword search in Research Gate provided 10 citations. After excluding articles by selecting free full text and full text, as well as years of the publication including 2010 to 2020 (exclusion 1), 3 articles

remained to be reviewed. After the title and abstract reviewing process for meeting the other inclusion criteria and relevance to the studied topic (exclusion 2), all 3 articles were retained.

PubMed is a free resource database that supports the search and retrieval of biomedical and life sciences literature and aims to improve health—both globally and personally. The PubMed database contains more than 30 million citations and abstracts of biomedical literature. A PubMed search is a list of citations (including authors, title, source, and often abstract) to journal articles and an indication of free electronic full-text availability. Keyword search when using the PubMed database showed 13 citations. After excluding articles by selecting free full text and full text, as well as years of the publication including 2010 to 2020 (exclusion 1), 8 articles remained to be reviewed. After the title and abstract reviewing process for meeting the other inclusion criteria and relevance to the studied topic (exclusion 2), 6 articles were identified for the systematic review.

Semantic Scholar is designed to be an AI-backed search engine for academic publications. It adds a layer of semantic analysis to the traditional methods of citation analysis and extracts relevant information from papers. Semantic Scholar highlights the most important and influential papers and identifies the connections between them. Keyword search when using Semantic Scholar showed 6 citations. After excluding articles by selecting free full text and full text, as well as years of the publication including 2010 to 2020 (exclusion 1), 4 articles remained to be reviewed. After the title and abstract reviewing process for meeting the other inclusion criteria and relevance to the studied topic (exclusion 2), 2 articles were retained for the systematic review.

Google Scholar provides a simple way to broadly search for scholarly literature. One can search across many disciplines and sources: articles, theses, books, abstracts, and court opinions, from academic publishers, professional societies, online repositories, universities, and other websites. Google Scholar helps researchers to locate relevant work across the world of scholarly research. Keyword search when using the Google Scholar database showed 15 citations. After excluding articles by selecting free full text and full text, as well as years of the publication including 2010 to 2020 (exclusion 1), 10 articles

remained to be reviewed. After the title and abstract reviewing process for meeting the other inclusion criteria and relevance to the studied topic (exclusion 2), 3 articles were identified for the systematic review. In total, 14 articles were included in this systematic review.

A quality assessment including checks for a clearly defined purpose, detailed description of the sample, relevant background and literature, applicability of the study to the research topic, and results with statistical significance, was conducted on the 14 articles included in the systematic review. This assessment revealed that all 14 of the articles corresponded with four of the five checks. On the issue of results with statistical significance, only 4 articles were quantitative and the results were reported using confidence intervals and P-values. Of the articles that remained 7 were cross-sectional, 1 was Descriptive and 2 were mixed. As such the remaining studies did not attract any statistical significance.

Geographical location was not limited to any specific territory and thus studies were conducted in many countries including the United States and Africa, Saudi Arabia, and Brazil. Also, most studies were conducted during the period of 2010 to 2020 and focused on the barriers or factors that influence the use of Personal Protective Equipment.

Data collection methods included questionnaires, interviews, focus groups, and observation. Also, the most common factors that influence the use of PPE were discovered to be unavailability, insufficient training, discomfort, and a lack of company policy and enforcement. See Figs. 1-3 to support these areas of influence.

4. DISCUSSION

The purpose of this review was to determine the factors that influence the use of Personal Protective Equipment (PPE) in the working environment. The focus areas were the medical, construction, agricultural, automobile, and manicurist fields. The results from the 14 articles in this systematic review suggest that the most common barriers to PPE use in the medical, agricultural, construction, food, wastewater, and manicuring industries are that the PPE is uncomfortable, and PPE unavailability at work as factors that influence PPE use. Other factors include the lack of knowledge about PPE use and the lack of company policy enforcement by top management.

“These personal protective equipment include goggles and glasses, gloves, face shields, gowns, head covers, shoe covers, respirators, and masks. The PPE protects users against the low, medium, and high-level hazards. In the hierarchy of controls (elimination, substitution, engineering, administration, and PPE), personal protective equipment is considered the least satisfactory method in the prevention of work-related injury or illness. PPE should be used to supplement or augment other means of hazard control, to further minimize the risk of injury” [28].

“Small scale industry employees are regularly and routinely exposed to numerous physical, chemical, and accidental hazards, which makes them a vulnerable occupational group. This is because, in developing countries, most of the workforce is employed in small and medium-scale industries that do not meet the minimum standards and guidelines set by the World Health Organization (WHO) and the International Labor Organization (ILO) for occupational health, safety, and social protection” [29].

Z'gambo [18] showed that “individual workers’ personal characteristics such as level of education, age, gender, and work experience, also affect the use of personal protective equipment. Several studies have documented the barriers to PPE compliance due to the lack of these characteristics”. Additionally, the lack of time, and the perception that the use of PPE interferes with the ability to perform the job, physical discomfort/difficulty communicating when wearing some of these gear such as masks.

Broughton [30] admonished employees that though their employers may be responsible for providing them with the correct and fully functioning PPE as part of their right to work, it does not give them the right to violate the compliance policy of wearing and adhering to safety regulations. He outlined and noted that it is the responsibility of the employees to ensure that they are educated and trained on how and when to fit and wear their PPE properly. It is also noted that they must acquire knowledge on how to clean, maintain, store, and dispose of it before he or she begins to work.

According to the Workers’ Compensation Board of British Columbia, workers are to wear all PPE required for the job; check that the PPE does not compromise their health and safety (for example, interfere with breathing, vision, communication,

or mobility); take care of their PPE- clean, maintain and store it properly; inspect their PPE for wear and tear and other damage before use; make sure PPE is repaired or replaced as necessary and report any damage to the supervisor or employer.

4.1 Motor Vehicle Repair Workers

Fig. 1. shows that the results from the study reveal that the majority of workers, 33 to 38% to be exact, were not using all the required Personal Protective Equipment due to its unavailability. Another 13.8% of the respondents cited the cost of the PPEs as a barrier to them not wearing them while 37.5% cited discomfort while using PPE as their reason for not using it. Further, 31.2% of the respondents said that their jobs did not require them to use PPEs. A focus group discussion with the respondents revealed that these workers were ignorant of the hazards relating to their job activities and therefore saw no need for them to use protective gear. A mere 7.5% said that PPEs interfere with or restrict their speed while performing tasks, and thus, decided to not to use them. Data also revealed that in an effort to fit in and conform to the norms in the workplace, 6.2% of the respondents did not wear PPEs [31].

4.2 Artisans

The column graph in Fig. 2, shows that manicurists who claimed to have training in areas other than biosafety had less knowledge about PPEs, and as such did not adhere to its use. Findings reveal that 58.6% of those respondents had some knowledge about PPEs, and 46.8% of them actually adhered to their use. Conversely, those that revealed that they had done a biosafety course showed greater adherence and knowledge of PPE. 64.6% of those workers gained knowledge after completing courses on biosafety and as such, 60% of them adhere to the training and make use of their PPEs. The results of this study were taken from [17] 235 manicurists. Results were calculated and revealed a 95% confidence interval, a standard deviation of 0.5, and a maximum estimated error of 0.05 [17].

Another study done by Apreko et al. [16], found that the key reasons given by most respondents for not using PPE were the non-availability of equipment, the PPEs were not designed for hot weather, and the equipment is being too heavy, causing inconvenience. This study was

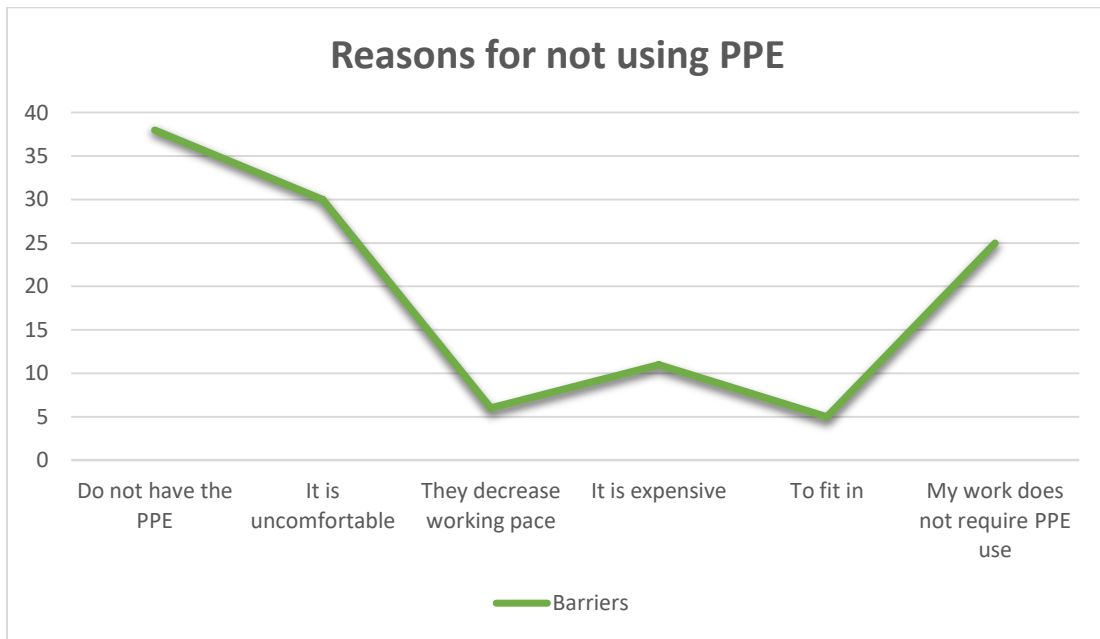


Fig. 1. Line Graph showing the barriers to PPE use among Motor Vehicle Repair Workers

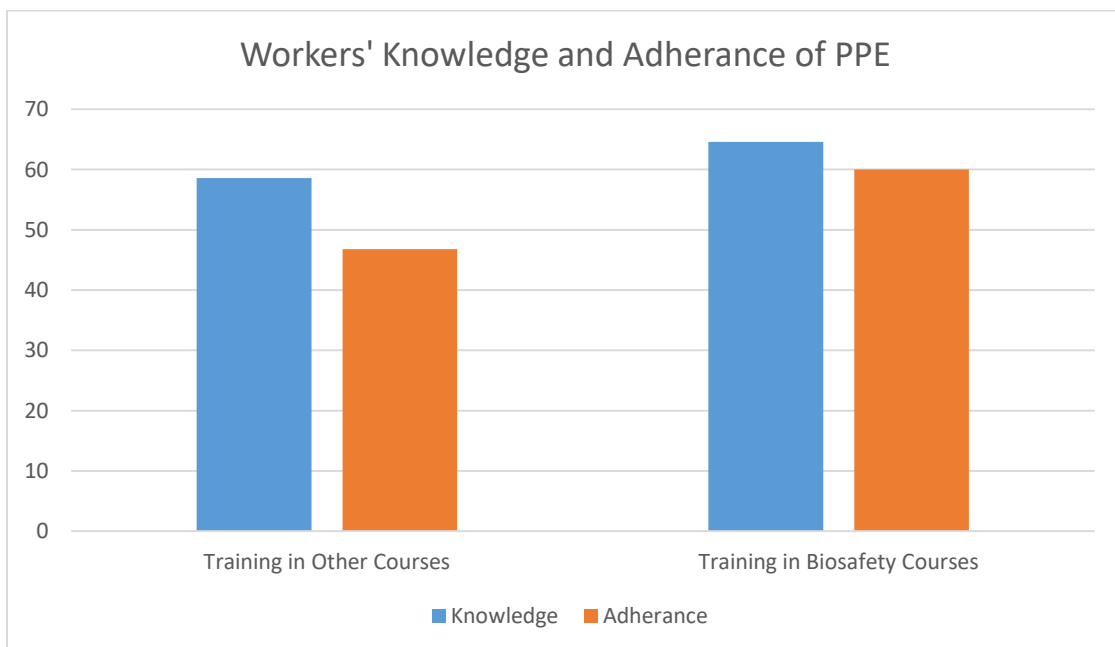


Fig. 2. Column graph showing training in PPE use and adherence against training in other areas and adherence

conducted in Ghana with 200 artisan workers and, the value of the Cronbach alpha test was 0.823.

4.3 Medical Workers

The pie chart in Fig. 3 shows that 75% of the hospital staff did not respond to the question of

always wearing protective equipment. However, 15% of the staff cited the inadequate number of PPEs as the reason they do not use them. Another 5% of the respondents cited frequent stock-outs of PPE as their reason for not complying with its use [32,33]. Further, 3% responded that the PPEs are too big in size and as such, they are unable to use them while 2%

stated that it is a lack of training that is responsible for their non-compliance [22]. “The commonest inhibiting factors to the use of PPEs even when available are the perception of low risk to hazard, forgetfulness, and disturbance with work activity (74.0%, 39.9%, and 22.5% respectively)” [20]. In Northern Uganda 59 health workers showed that where poor fitting and PPE, frequent stock-outs, and inadequate PPE as well as, lack of training in PPE are barriers to PPE use [24].

4.4 Wastewater Workers

Wright [27] in a study, “reveal data collected from 272 Public wastewater workers located at 33 wastewater facilities across the southeast region of the United States. When asked about the

barriers that prevented the participants from wearing PPE, the participants “agreed” and “strongly agreed” that uncomfortableness was a barrier to wearing PPE (43.7%)”.

The Table 1 displays 39.7% of the respondents agreed that wearing PPE is uncomfortableness. 19.1% agreed that PPE interferes with their ability to execute their jobs. 11.4% agreed that PPE is not always available to them while 4.8% agreed that coworkers would make fun of them for wearing PPEs. 8.5% of the respondents also agreed that their supervisors seldom wear PPE when required and 3.7% agreed that wearing PPE is just too convenient. These results clearly show that many wastewater workers choose not to wear their personal protective equipment because of a lack of comfort.

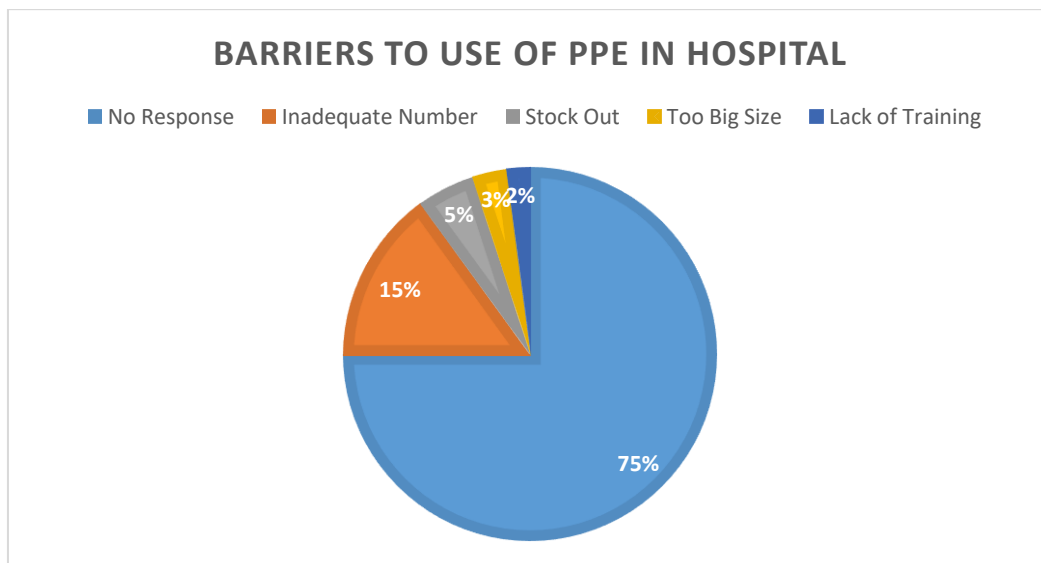


Fig. 3. Pie Chart Showing Barriers to PPE Use in a Hospital

Table 1. Showing wastewater workers perceived barriers to wearing PPE

Perceived Barrier	Strongly Agree (%)	Agree %	Neither Agree nor Disagree %	Disagree %	Strongly Disagree %
Wearing PPE is uncomfortable	4.0	39.7	30.5	22.1	3.1
PPE interferes with my ability to do my job	0.4	19.1	34.2	39.3	7.0
PPE is not always available to me	2.7	11.4	9.6	45.2	30.9
My coworkers would make fun of me for wearing PPE	1.1	4.8	6.6	51.8	35.7
My supervisor seldom wears PPE when required	4.0	8.5	18.0	42.3	27.2
Wearing PPE is just too inconvenient for me	1.1	3.7	9.6	54.8	27.2

4.5 Farming and Food

Data from 330 chili-growing farmers showed that most of the respondents demonstrated a low level of knowledge regarding PPE and pesticide use, were mostly not concerned about the use and demonstrated a fair level of practice in terms of using PPE [14]. Data from another study conducted [15] among 187 workers of five industries (Beer, Rio, Chesse-balls, Chips, and Wafer) in Nepal, concluded that the main reasons for not using PPE were unavailability of PPE (33.3%) and no necessity of using PPE (66.7%) [15].

4.6 Construction and Factory

In Kenya data from 104 construction workers showed that among the participants, 45.0% were using the right PPE. However, more than half of the workers did not have any Personal Protective Equipment (PPEs). About 76.0% of participants had not been trained on PPE use and any other safety training [21]. A study in Ethiopia found that among 159 particleboard factory workers and 13 management personnel, the reasons for not using any type of PPE were reported to be lack of access (59%), lack of knowledge of its importance (33%), not comfortable (3.9%), not useful (1.9%), and 1.9% said that PPE was easily damaged. These results were presented using Chi-square tests, *T* tests and Correlation analyses for categorical and continuous data in this study. Sah et al. [19] in “a study conducted in Nepal among 100 cement factory workers showed that the variables of having significant influence on the knowledge and practice of workers about occupational hazards were education, receiving information about the job-associated hazards, and attending a training course about occupational health and safety”. These findings were supported by Asgedom et al. [26] in similar findings. “Meanwhile, a study was conducted in Saudi Arabia among 102 workers from 28 small-scale industries. The survey shows that policies and measures for delivery of OSH services were limited and deficient for the studied population. Even though the laws, regulations, and policies are in place, their implementation, inspection, and audits for proper adherence to standards need to be improved in the studied workshops” [34]. “Another study conducted in Zambia among 430 welders, showed that education was associated with awareness regarding hazards and PPE as well as the use of PPE. Descriptive statistics were used in the analyses of this data,

and Chi-square and ANOVA tests were used for comparing study variables” [18].

Clearly, the main recurring cry of workers across the board is that PPE is uncomfortable, followed by unavailability at work, as the main factor that influence PPE use. Other factors include the lack of knowledge about PPE use and the lack of company policy of enforcement by top management.

5. CONCLUSION

An Institute of Medicine (IOM) report, and other studies including this one, show that there are a range of factors that influence PPE-related behaviors and compliance [35].

It must be highlighted that the attitudes, and beliefs of workers regarding the efficacy of Personal Protective Equipment, as well as work environment factors like the availability of PPE and training on its use, contribute significantly to workers’ decisions in regard to PPE use.

It was found that workers’ use of PPEs is suboptimal and this, therefore, results in exposure to many hazards. As such, the training of workers in health and safety, and PPE use, which also entails hazard identification and measures of eliminating those hazards is vital. Heightened awareness in this area will foster positive attitudes towards the use of Personal Protective Equipment among all workers, which would lower the risk of hazards, and the destruction of companies’ names.

Finally, individual factors such as knowledge, beliefs, and attitudes; environmental factors including availability of equipment; and organizational factors e.g. workplace policies and training/education programs, are the important barriers to workers’ use of Personal Protective Equipment in many privately-owned and operated businesses.

6. RECOMMENDATIONS

Occupational risks can be greatly reduced and even avoided through the implementation of good Occupational Health and Safety Practices, especially the use of Personal Protective Equipment. These can significantly enhance the well-being of workers while improving their productivity at the same time. Therefore, the maintenance of PPE awareness and compliance is necessary, especially in the private or informal

sector where oversight by Government safety departments is lacking. As such, the researchers recommend the following:

- The more extensive the workers' inclusion in every stage of the program, the smoother the program will be to enforce and actualize. Thus, users must be educated about why the PPE should be worn and be trained on how to properly use it.
- Designation of a program coordinator will aid in ensuring the success of a PPE program in the workplace. The coordinator will be responsible for ensuring that each of the elements of a PPE program is in place and operational.
- Employers should seek to provide the required PPEs in various sizes to cater to the needs of all employees.
- Commendations should be given when workers are compliant with PPE requirements or use.
- Regular inspections should be done to ensure that workers are using their PPEs and using them correctly. Failure to comply should involve some form of discipline.

COMPETING INTERESTS

Author has declared that no competing interests exist.

REFERENCES

1. Martinelli, K. [Internet]. Hazards in the Workplace: 6 Categories of Hazards [cited January 19, 2019; updated July 02, 2020]. Available: <https://www.highspeedtraining.co.uk/hub/hazards-in-the-workplace/>
2. Health and Safety Executive. Employers' Responsibilities to Workers on Providing Personal Protective Equipment (PPE). [Internet]; 2019. Available: <https://www.hse.gov.uk/contact/faqs/ppe.htm#:~:text=Every%20employer%20shall%20ensure%20that,are%20equally%20or%20more%20effective.>
3. ILO. Personal protection - Personal protective equipment. [Internet]. 2003; October 2019. Available: <https://www.ilo.org/legacy/english/protection/safework/cis/products/safetytm/chemcode/09.htm>
4. Occupational Safety and Health Administration. Personal Protective Equipment. [Internet] OSHA 3151-12R; 2004. Available: <https://www.osha.gov/sites/default/files/publications/osh3151.pdf>
5. Ward, A. Workers Risking Injury by Not Wearing PPE. [cited 2010, August 17; updated November 2019]. [Internet]. Available: <https://www.infectioncontroltoday.com/personal-protective-equipment/workers-risking-injury-not-wearing-ppe.>
6. Pyrek KM. Addressing the challenges of PPE non-compliance. [Internet] [cited 2011; updated July 05, 2020]. Available: <https://www.infectioncontroltoday.com/view/addressing-challenges-ppe-non-compliance>
7. US Department of Labor. Commonly Used Statistics. [Internet] 2020, [July 5] Available: <https://www.osha.gov/data/commonstats>
8. Giuffrida A, Lunes RF, Sayedoff WD. Occupational risks in Latin America and the Caribbean: economic and health dimensions. *PubMed J.* 2002;17(3):235-46. [Internet]. Available: <https://pubmed.ncbi.nlm.nih.gov/12135989/>
9. Kowlessar G. 102 Fatal Accidents at Work. January 28, 2020. *The Trinidad and Tobago Guardian News Paper.* [Internet]. Available: <https://www.guardian.co.tt/article-6.2.358161.4844c7445a>
10. Guyana Labor Forces Survey. The 2017 Fourth Quarter Report. [Internet]; 2018. Available: https://statisticsguyana.gov.gy/wp-content/uploads/2019/10/GLFS_2017_Quarter4_Final-PDF-1.4MB.pdf
11. Chabrol D. 2 electrocuted, others injured at providence stadium. June 12, 2019. *The Demerara Wave News Paper.* [Internet]. Available: <https://demerarawaves.com/2019/06/11/technician-driver-electrocuted-others-injured-at-providence-stadium/>
12. Safety and health at the workplace must be the priority of all employers and employees. April 28, 2019. *The News Article.* [Internet]. Available: <http://guyanachronicle.com/2019/04/28/safety-and-health-at-the-workplace-must-be-the-priority-of-all-employers-and-employees>
13. Helder Cesar Tinoco Gilson Brito Alves Lima Annibal Parracho Sant'Anna Carlos Francisco Simões Gomes João Alberto Neves dos Santos. Risk perception in the use of personal protective equipment

- against noise-induced hearing loss. *Gest. Prod.* 2019;26(1). Available:<https://www.scielo.br/j/gp/a/86ddmt98yLS3LrW3BTPd3Qr/?lang=en>
14. Norkaew S. Knowledge, attitude, and practice of using Personal Protective Equipment (PPE) for chih-growing farmers in Huarua sub-district, Mueang district, Ubonrachathani province, Thailand. *Journal of Health Research.* 2013; 2010:24(2):93-100. [Internet]. Available:<https://scholarship.libraries.rutgers.edu/esploro/outputs/journalArticle/991031550123904646>
 15. Acharya, S. R. Utilization Pattern of Personal Protective Equipment among Industrial Workers of Nawalparasi, Nepal. School of Health and Allied Sciences Pokhara University, Kaski. *ResearchGate*; 2014 Dec. 13(2). [Internet]. Available:<https://www.nepjol.info/index.php/HPROSPECT/article/view/11833>
 16. Apreko A, Danku L, Akpele M, Apeletay A. Occupational health and safety management: the use of personal protective equipment (PPE) by artisans in the local automotive industry in Volta Region, Ghana. *IJETT* 2015; October 2019: 19(4). Available:<https://doi.org/10.14445/22315381/IJETT-V19P236>
 17. Garbaccio L. Juliana, De Oliveira C. Adriana. [Internet]. Adherence and knowledge about the use of personal protective equipment among manicurists. *ResearchGate*; 2015. Available:https://www.researchgate.net/publication/276070823_Adherence_and_knowledge_about_the_use_of_personal_protective_equipment_among_manicurists
 18. Z'gambo J. Occupational hazards and use of personal protective equipment among small scale welders in Lusaka, Zambia. [Thesis on Internet]. University of Zambia School of Medicine Department of Public Health; 2015. [cited 2015 Oct; published 2019]. Available:<http://hdl.handle.net/1956/10194>
 19. Sah PJ, Shah SK, Yadav DK, et al. Knowledge and practice related to Occupational Hazards among Maruti Cement Factory workers in Mirchaiya, Siraha, Nepal. *Microbes and Health.* 2015 Dec 9;4(2):11-18. [Internet]. Available:<https://doi.org/10.3329/mh.v4i2.23138>
 20. Emmanuel N. Aguwa, Sussan U. Arinze-Onyia, Anne Ndu. [Internet]. Use of personal protective equipment among health workers in a tertiary health institution, Southeast Nigeria: Pre-Ebola Period; 2016. Available:https://www.ijhsr.org/IJHSR_Vol.6_Issue.8_Aug2016/2.pdf
 21. Muema LM. [Internet] Evaluation of personal protective equipment utilization among construction workers in Mombasa County, Kenya. (Occupational Safety and Health) Jomo Kenyatta University of Agriculture and Technology; 2016. Available:<http://ir.jkuat.ac.ke/bitstream/handle/123456789/2397/lilian%20mwongeli%20final%20%2031%2C10.16.pdf?sequence=1&isAllowed=y>
 22. Powers D, Armellino D, Dolansky M, Fitzpatrick J. Factors influencing nurse compliance with standard precautions. *Am J Infect Control.* 2016 Jan 1;44(1):4-7 [Internet]. Available:<https://www.ncbi.nlm.nih.gov/pubmed/26769280>
 23. Munyua FW. [Internet]. Factors influencing use of personal protective equipment (PPE) by Motor Vehicles Repairs Workers in Kigandaini. Thika; 2017. Available:<http://erepository.uonbi.ac.ke/handle/11295/102695>
 24. Okello TR, Kansime, Odora J, Apio JA, Pecorella I. [Internet]. Barriers and factors affecting personal protective equipment usage in St. Mary's Hospital Lacor in Northern Uganda; 2017. Available:https://www.researchgate.net/publication/318557093_Barriers_and_factors_affecting_personal_protective_equipment_usage_in_St_Mary%27s_Hospital_Lacor_in_Northern_Uganda
 25. Ahmad I, Balkhyour M, Ishmail I, Rehan M. Workplace safety and health conditions and facilities in small industries in Jeddah, Saudi Arabia. *ResearchGate* 2017 May; updated November 2019. [Internet]. Available:<https://doi.org/10.5296/jss.v3i1.11104>
 26. Asgedom AA, Bråtveit M, Moen BE. Knowledge, attitude and practice related to chemical hazards and personal protective equipment among particleboard workers in Ethiopia: a cross-sectional study. *BMC Public Health.* 2019 Apr 27;19(1):440. Available:<https://doi.org/10.1186/s12889-019-6807-0>

27. Wright T, et al. Issue of compliance with use of personal protective equipment among wastewater workers across the Southeast Region of the United States. *Int J Environ Res Pub Health*. [Internet] 2019 Jun;16 (11):2009. Available:<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6603999/>
28. University of Western Australia, 2016. Safety, Health and Injury Management, and Wellbeing. Personal Protective Equipment (PPE) Guideline. [Internet]. Available:<https://www.safety.uwa.edu.au/topics/physical/protective-equipment>
29. Barling J, Loughlin C, Kelloway EK. Development and test of a model linking safety-specific transformational leadership and occupational safety. *J Appl Psychol* [Internet]. 2002;87(3):488–496. Available:<https://doi.org/10.1037/0021-9010.87.3.488> or <https://psycnet.apa.org/record/2002-01666-007>
30. Broughton C. [Internet]. Employees' Responsibilities for PPE. [cited February 04, 2014; November 2019]. Available:<https://www.protecdirect.co.uk/Protect-PPE-Blog/Employees-Responsibilities-for-PPE~ba~EmployeesPPEBlog>
31. Wanjiku MF. Factors influencing the use of personal protective equipment (PPEs) by motor vehicle repair workers in Kigandaini, Thika. [Thesis on Internet]. University of Nairobi; 2014. Available:<erepository.uonbi.ac.ke/bitstream/handle/11295/102695/FLACIAH%20WANJIKU%20MUNYUA%20FINAL%20PROJECT.pdf?sequence=1&isAllowed=y>
32. Garbaccio L, Juliana, De Oliveira C, Adriana. [Internet]. Adherence and knowledge about the use of personal protective equipment among manicurists; 2015. Available:https://www.researchgate.net/publication/276070823_Adherence_and_knowledge_about_the_use_of_personal_protective_equipment_among_manicurists
33. Toney R. Electrician electrocuted in Essequibo. *The Guyana Chronicle*. August 6, 2018. [Internet]. Available:<http://guyanachronicle.com/2018/08/06/electrician-dies-after-being-electrocuted-in-essequibo>
34. Balkhyour MA, Ahmad I, Rehan M. Assessment of personal protective equipment use and occupational exposures in small industries in Jeddah: Health implications for workers. *Saudi Journal of Biological Sciences*. [Internet]. 2019;26(4):653-659. Available:<https://www.sciencedirect.com/science/article/pii/S1319562X1830161X>
35. Institute of Medicine (US) Committee on Personal Protective Equipment for Healthcare Personnel to Prevent Transmission of Pandemic Influenza and Other Viral Respiratory Infections: Current Research Issues. [Internet]. Using PPE: Individual and Organizational Issues. [cited 2010; updated July 05, 2020]. Available:<https://www.ncbi.nlm.nih.gov/books/NBK209587/>
36. United States Department of Labor. Personal Protective Equipment. Occupational Safety and Health Administration. [Internet]. Available:<https://www.osha.gov/personal-protective-equipment>
37. Oxford Dictionary. Workplace. [Internet]. Available:<https://www.lexico.com/definition/workplace>
38. Merriam- Webster Dictionary. Workers. 1828. [Internet]. Available:<https://www.merriam-webster.com/dictionary/worker>
39. Brock T, Reeves M. What is private sector? Investopedia. [Internet]. [Updated Dec. 2020]. Available:<https://www.investopedia.com/terms/p/private-sector.asp>

APPENDIX

DEFINITION OF TERMS

1. Personal Protective Equipment- is equipment worn to minimize exposure to hazards that cause serious workplace injuries and illnesses [36].
2. Workplace- a place where people work, such as an office or factory [37].
3. Worker- one that works especially at manual or industrial labor or with a particular Material [38].
4. Private Sector- the part of the economy run by individuals and companies for profit and is not state-controlled [39].

© 2023 James et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:
The peer review history for this paper can be accessed here:
<https://www.sdiarticle5.com/review-history/95503>