

PEER REVIEW HISTORY

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ARTICLE DETAILS

TITLE (PROVISIONAL)	Description of the epidemiological characteristics of work-related eye injuries in Spain. A retrospective study.
AUTHORS	Martin Prieto, Sergio; Álvarez Peregrina, Cristina; Thuissard-Vasallo, Israel; Catalina Romero, Carlos; Calvo Bonacho, Eva; Villa Collar, César; Sánchez Tena, Miguel Ángel

VERSION 1 – REVIEW

REVIEWER	Fabriziomaria Gobba University of Modena and Reggio Emilia
REVIEW RETURNED	26-Nov-2019

GENERAL COMMENTS	<p>General Comments:</p> <p>The MS describe a study on occupational eye injuries extracted from data of an insurance company in Spain during the period 2008-2018. The main results are that: “Males, 16-24 age group and industry occupation group have the highest relative risk (RR) and incidence for WREI”, and that : “The incidence of WREI decreased over the study period in all variables”.</p> <p>The conclusions (reported in the Abstract, but not in Conclusions section) are that “Specific programs for ocular protection and changes in occupation were the most probable causes.”</p> <p>In principle, topic is of potential interest, and data presented are based on a large sample, but there are several problems in the study.</p> <p>Just to mention the main:</p> <p>Are data from IBERMUTUA adequately representative of the workforce in Spain? Or is the sample a selection not representative (as data reported in Table 2 suggest)? And, in this case, who are the workers included in the study, and who are that not adequately represented, compared to the whole workforce in Spain? Is there a selection (e.g. is it possible that construction workers, or some specific subgroup , e.g. road workers, or other, are overrepresented?; was the proportion of workers engaged in different occupations adequately stable during the whole period considered, or some occupations changed?)</p> <p>Data collected are really raw:</p> <ul style="list-style-type: none">-activities classification is limited to general sectors (agriculture, Industry, etc.); but this is too vague: “Industry” includes hundreds of tasks very different in terms of injury risk, and this is a fundamental aspect in terms of risk evaluation/definition of preventive interventions;- no description of the type of injury occurred, of the cause, of the prognosis, of the consequence, etc. is reported; this is another
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	<p>relevant limit, precluding any evaluation of the impact (e.g. the economic impact), and of possible prevention. Furthermore, the Authors explain the reported decrease in occupational eye injuries as the result of “Specific programs for ocular protection and changes in occupation” but what programs were introduced, and/or what changes occurred? Absolutely no data!</p> <p>As a conclusion, the results presented in this MS are of limited interest, and do not provide useful data on the topic of occupational eye injuries impact and prevention needs.</p> <p>Specific Comments:</p> <p>Page 2 Abstract: Line 6: Objective In my opinion the objective of the study d' be to describe the general phenomenon of WREI, and to follow the temporary trend in a 10 ys period, in Spain. The data of the insurance company are the tool, but the results should be representative at national level. If the objectives are different it'd be explained here.</p> <p>Design</p> <p>Line 16: “ ... The work-related eye injuries were characterised by ... occupation.” : in fact data are referred to occupational sectors, not to the occupations of the injured workers. “</p> <p>Line 21. Outcomes are the yearly incidence, etc.</p> <p>Participants: Line 26 : “ included all workers insured by one such company “: why this one? Is this company different from other companies (e.g. is the largest insurance, or other)? Is it possible to introduce here, (and explain better in the Methods section)?</p> <p>Results: Lines 34-36: “ The average incidence was 429.75/100,000 working population and 4,273.36/100,000 IBERMUTUA accidents. “ Not clear what these numbers are, and the meaning. Furthermore, introduce “ IBERMUTUA. “ :</p> <p>Lines 36-38: Suggestion: better before introduce who: “ Males, 16- 24 age group and industry occupation group have the highest relative risk (RR) and incidence for WREI “ and then the trend to decrease</p> <p>Conclusions: Line 41 “ Specific programs for ocular protection and changes in</p>
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occupation over the 10-year study period” what are the mentioned "specific programs"? Not introduced or explained (here or also in the Discussion or in other Sections)

Line 29:

Introduce the term WREI

Absent, how long? Is it possible to know the number of working day lost?

STRENGTHS AND LIMITATIONS OF THIS STUDY

“This study covers the largest area and the highest number of workers of those published in Europe to date.”:

We agree that the number is important, but it is also important the representativeness (e.g. was the sample adequately representative of the 4 occupational sectors? Is there the possibility of selection bias or other bias?

“The long period of study indicates the results are not only due to specific changes in the insured company but rather to changes in Spanish workers”:

can the Authors explain better what “ changes in Spanish workers” what means?

“Even though having the highest number of cases is an advantage, it makes analysis of the database very difficult, which explains why we missed some cases in the different variables”:

on my opinion there are many other limitations, e.g.

- the working activities are only classified as sectors (Agriculture, Industry, etc.), but “Industry” includes hundreds of tasks very different in terms of injury risk;

- how are the Authors confident that IBERMUTUA data be considered representative of the overall phenomenon of eye injury in Spain? Or presented data represent a partial (=biased) scenario?

- the cause and type of trauma were not collected (what eye injuries? foreign bodies? burns? What else?) as were not the consequences (e.g. prognosis, permanent damages, etc.)

Page 4

Line 6:

I suggest to move the ethical aspects at the end of the section

Line 16:

Please explain what IBERMUTUA is. Public/private company?

Apparently Is only one among different insurance companies, covering about the 6% of all workers. Is it possible a selection of the activities covered (e.g. mainly some specific work sectors), possibly biasing the results?

Line 23:

“The area of study covered all regions in Spain including Ceuta and Melilla, comprising an approximate area of 505,983 km² “ The number of km covered is not the relevant parameter here

Line 29:

“ 11,696,259 subjects ... “ and 201,167,800 workers ... “: how were these numbers calculated?

	<p>Page 8 Conclusions “Specific knowledge of the incidence and relative risk of work-related eye injuries could be essential for designing programs to prevent accidents in the workplace. “ What preventive programs, if the Authors do not tell what are the occupational activities “at risk”, what are the injuries, and what the causes? “This study contains the highest number of cases of any published in Europe to date, so the results are significant.” These conclusion is wrong: the quality of data, not the absolute number, give a signficance to a study.</p>
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REVIEWER	Muhammed Batur Van Yuzuncu Yil University MEdical Faculty, Department Ophthalmology
REVIEW RETURNED	12-Dec-2019

GENERAL COMMENTS	The authors wrote " Ibermutua accidents 1,17,9067" in table 1, they should correct this data.
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REVIEWER	Kajo Bućan DEPARTMENT OF OPHTHALMOLOGY UNIVERSITY HOSPITAL SPLIT CROATIA
REVIEW RETURNED	01-Jan-2020

GENERAL COMMENTS	All sections of the article are well laid out from start to finish, with clear goals and working methods. I feel competent, after a critical reading of the paper, to propose this article for publication — namely, the very same article I have published related to child injuries over a ten-year period. The results are well statistically processed and more or less expected. The discussion is fair and shows the differences in the data obtained from other studies with critical review and explanation. Article accepted for publication!
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REVIEWER	Einat Shneor Hadassah academic college, Jerusalem, Israel
REVIEW RETURNED	10-Feb-2020

GENERAL COMMENTS	<p>General comments: A thorough editing of the English should be carried out, since in several part of the paper it is very difficult to understand what the authors meant. The paper lack of important information that can help to understand better the aims, the methods and the results of the manuscript. After describing the relevant missing information, the aims and results of the manuscript will become clearer, and the manuscript may be of interest and add relevant information to the scientific literature. Much more explanation about the general health system in Spain, including information on insurance company, will help to understand better the aim of the study, the methods, analysis and results. The author mentioned IBERMUTUA, but did not described what exactly this is, and this is not clear especially to non-residents. Same for tolbermutua? What is it? What is it insurance system in Spain? Does everyone have it? Across all ages? Does it cost money? Does it is obligatory? Does it include only people who work? Does it include people who work in</p>
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	<p>private business? At home? This information is crucial for understanding better the cohort of the study and respectively the results and conclusions.</p> <p>General description of Spain population can be helpful, especially in the areas that the insurance company cover. Does the study population can represent the population in Spain?</p> <p>Introduction</p> <p>The introduction is not detailed enough and does not give enough relevant information that will help understand the purpose of the research and the research methodology.</p> <p>The author must give more details and describe the health and insurance system so the readers can understand what data could be collected or have been collected.</p> <p>In the introduction and discussion, a lot of science background is missing. It is not clear what has been done and is known so far in the world and in Spain in particular - and accordingly it will possible to understand the purpose of the study and why it is being carried out. (see comments on this in discussion as well) .</p> <p>Research Methods AND Statistics:</p> <p>Author should explain how the data were saved (computer system), so it will be possible to understand how injury classification has been made and by whom. What is the difference between ICD and CIE-9-MC?</p> <p>What is the difference between "number of WREI" and "insured/accident per 100,000 population in IBERMUTUA (ratio/100,000 population)". This should be clarified.</p> <p>How RR was calculated?</p> <p>It is not clear how the analysis was performed when there are several factors that should be taken into consideration - this issue is not explained in the methods section. For example, when there are several age groups or several risk factors?</p> <p>Author may performed linear regression and uni and multi variable analysis to see what factors influence the prevalence of eye injury and the interaction between these factors.</p> <p>Results</p> <p>The way results (table and figures) are presented are not clear. Please present data both in text and tables/figure mostly in %. If men are presented, you do not need to show results for women (100-%men).</p> <p>Table 1 is very unclear and does not adequately illustrate the results of the study. It is necessary to give relevant information in the table and mostly include percentages. It would also be interesting to know in each profession how was the sample distribution by age? It will be interesting to know the prevalence of eye injuries in different age groups, especially in men. Is there a significant difference between men and women in the incidence of eye injuries? By age? By profession? The influence of risk factors interaction (gender, profession, age group) will add interest to the paper.</p> <p>While it is very interesting to see the development by year and whether the number of eye injuries has decreased over the years, it is also interesting to see average results in general - this is especially relevant in the discussion - when the authors describe difficulty comparing their results to other studies.</p> <p>Table 2 is not clear</p> <p>Figures are not clear mainly because several phrases (e.g. tolbermutua) are not explained. Also the unites author used are not clear and it make it difficult to understand</p> <p>Discussion</p> <p>The discussion should be re-written, in accordance with the research</p>
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	<p>objectives and methods.</p> <p>A comparison of results has been made with research done not only by insurance companies. For example, authors mention several papers while all of them have been done in clinics/hospital etc. e.g. Sahraravand et al., Acta Ophthalmol. 2017; Yu TSI, Liu H, Hui K. Ophthalmology. 2004.</p> <p>The paper of Gobba et al., 2017; was done in Ophthalmological Emergency Department (OED) of Modena University Hospital, and it is not the same as in this study. Author should separate between studies that were carried out in hospitals or clinics vs. studies that had data from insurance companies. In addition, author must discuss this in discussion and limitation of the study-since the cohort of this study may not represent the actual population that have eye injury (maybe not all the population sue the insurance company). If the author will compare results with studies performed in hospitals, he should mention more papers in the area, such as:</p> <ul style="list-style-type: none"> • Vaziri, et al., Ophthalmology. 2016 April ; 123(4): 917–919 • Stagg et al., Ophthalmology 2017;124:720-729 • R. Sterling Haring et al., Injury, Int. J. Care Injured 47 (2016) 104–108 • Desai et al., Eye (2015) 29, 611–618 • L. C. Northey et al. Ophthalmic Epidemiology, 2014; 21(4): 237–246 • El-Mekawey et al Clinical Ophthalmology 2011:5 955–960 • Fea et al., Graefes Arch Clin Exp Ophthalmol (2008) 246:175–179 • McGwin et al. Invest Ophthalmol Vis Sci. 2006;47:521–527 • Cao H, Li L, Zhang M (2012) PLoS ONE 7(10) • And more.... <p>Comparison of different papers and the current study can be presented in a table that includes the different methodology that was used in each study.</p> <p>Author may discuss some of this paper in the introduction as well Abstract - should be re-written in more details (in relation to the comments in the manuscript). Please give more details in the methods and in the results section.</p>
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VERSION 1 – AUTHOR RESPONSE

RESPONSES TO REVIEWER'S COMMENTS:

Comments Reviewer 1:

- COMMENT: Are data from IBERMUTUA adequately representative of the workforce in Spain? Or is the sample a selection not representative (as data reported in Table 2 suggest)? And, in this case, who are the workers included in the study, and who are that not adequately represented, compared to the whole workforce in Spain? Is there a selection (e.g. is it possible that construction workers, or some specific subgroup , e.g. road workers, or other, are overrepresented?; was the proportion of workers engaged in different occupational sectors adequately stable during the whole period considered, or some occupational sectors changed?)

RESPONSE: Thank you very much for your comment. Data from IBERMUTUA adequately representative of the workforce in Spain. We have removed the name of ibermutua from table 2 to avoid misunderstandings.

According to the last official data from Ibermutua and INE (National Statistics Institute), Ibermutua covered to 1,585,534 of the 22,806,800 workers in Spain in 2018.

In our study, the workers insured by Ibermutua in the 10-years period were 5.81% (SD ±0.221) of the Spanish workers in the same period (page 5, line 39). It is important to highlight that the evolution of total Spanish workers and IBERMUTUA insured have the same trend along the study period as figure 1 shows (p=0.9987).

All workers insured by IBERMUTUA were included in the study, there were not any subgroup excluded.

Regarding the changes among different sectors, there have been changes in this 10-years period. In 2008, 3% of the Ibermutua insured were from agriculture, being in 2018 the 6%. The industry had 14% of the subjects of our sample in 2008, decreasing to 12% in 2018. Construction changed from 13% of the subject to 7% in 2008 and 2018 respectively and services have increased from 70% in 2008 to 75% in 2018. This data is aligned with the behavior of the Spanish active population, except for agriculture, where the number of insured by Ibermutua increases while Spanish workers decrease. The third paragraph in results has been modifying as following:

Workers insured by IBERMUTUA constituted an average of 5.81% (SD \pm 0.221) of all workers in Spain, and the rate of change between workers insured in IBERMUTUA and total workers in Spain in the study period did not show statistically significant differences ($p=0.9987$) (Figure 1). This rate of change did not show statistically significant differences in services and industry. The decrease in Spanish construction workers was higher than IBERMUTUA construction insured over the study period, however, the trend is very similar. This trend was very different in Agriculture where Spanish workers decrease against IBERMUTUA insured who increased its number.

- COMMENT: Data collected are really raw: activities classification is limited to general sectors (agriculture, Industry, etc.); but this is too vague: "Industry" includes hundreds of tasks very different in terms of injury risk, and this is a fundamental aspect in terms of risk evaluation/definition of preventive interventions;

RESPONSE: We appreciate and share this observation. However, official data is divided into these four sectors. It is important to use these four groups to make comparisons with the Economically Active Population Survey made by INE (National Statistics Institute), a legally independent administrative Autonomous institution assigned to the Ministry of Economic Affairs and Digital Transformation, that uses this classification (CNAE-2009).

CNAE-2009 is the National Classification of Economic Activities resulting from the international revision process known as Operation 2007 and has been compiled according to the conditions set out in the Regulation approving NACE Rev.2 and which replaces the CNAE-93 Rev.1. The objective of this classification is to establish a hierarchical group of economic activities that may be used to:

- 1) promote the implementation of national statistics that may be differentiated according to the activities established.
- 2) classify statistical units and entities according to the economic activity carried out.

As far as we understand that it could be a limitation, we have included as a limitation in the paper:

STRENGTHS AND LIMITATIONS OF THIS STUDY:

- Economic activities have been classified according to CNAE-2009 and not divided into specific groups

- COMMENT: no description of the type of injury occurred, of the cause, of the prognosis, of the consequence, etc. is reported; this is another relevant limit, precluding any evaluation of the impact (e.g. the economic impact), and of possible prevention.

RESPONSE: Thank you very much for your comment.

Although we think that the description of the type of injury occurred, of the cause, of the prognosis, of the consequence, etc. will be really of interest, the general objective of this study is to describe the epidemiological characteristics of work-related eye injuries (WREI) in Spain. Describing the situation in Spain about WREI is just a first step. We think that it would be a good recommendation for future studies.

To attend your suggestion, we have modified conclusions as follow:

Specific and descriptive knowledge of the incidence and relative risk of work-related eye injuries is the first step for designing programs to prevent accidents in the workplace.

- COMMENT: Furthermore, the Authors explain the reported decrease in occupational sectoral eye injuries as the result of “Specific programs for ocular protection and changes in the occupational sector” but what programs were introduced, and/or what changes occurred? Absolutely no data!

RESPONSE: Thank you very much for your comment.

About the “Specific programs for ocular protection”, we have supposed that companies had contingency plans to prevent injuries, but we are not sure about that.

Regarding changes in the occupational sector, as we said before, there have been changes in this 10-years period. In 2008, 3% of the Ibermutua insured were from agriculture, being in 2018 the 6%. The industry had 14% of the subjects of our sample in 2008, decreasing to 12% in 2018. Construction changed from 13% of the subject to 7% in 2008 and 2018 respectively and services have increased from 70% in 2008 to 75% in 2018. The increase in the proportion in the sample of workers from sectors with a lower risk of WREI could affect the general decreasing of the risk

We have completed the discussion as follow:

- This generalized decrease might be the result of unknown specific eye protection plans proposed by the companies and IBERMUTUA. Variation in occupational sectoral sector incidence over the study period could be another reason for this decrease. So, sectors with lower risk (agriculture and services) have increased his proportion (81% in 2018 vs 73% in 2008) and this makes that incidence of WREI also decrease in general.

- SPECIFIC COMMENTS:

Page 2

Abstract:

Line 6:

Objective

In my opinion the objective of the study d' be to describe the general phenomenon of WREI, and to follow the temporary trend in a 10 ys period, in Spain. The data of the insurance company are the tool, but the results should be representative at national level. If the objectives are different it'd be explained here.

RESPONSE: We appreciate your comment. Your observation is our main objective. We consider the results of our study are representative of the national trend during the period, so we have changed the text. You can find the changes in red:

OBJECTIVE: To describe the epidemiological characteristics and trends of work-related eye injuries (WREI) in Spain over 10-years period by sex, age, and occupational sector.

and at the end of the introduction:

The main objective of this study was the epidemiological characterization of WREI causing ocular injury in Spain by sex, age and occupational sector over a 10-years period.

Design on abstract.

Line 16:

“ ... The work-related eye injuries were characterised by ... occupational sector.” : in fact data are referred to occupational sectoral sectors, not to the occupational sectors of the injured workers. “

RESPONSE: Thank you for your comment. Data are referred to occupational sectoral sectors where workers are included so we have changed to occupational sectoral sectors or sectors to clarify this point. Changes are in red through all the paper

Line21.

Outcomes are the yearly incidence, etc.

RESPONSE: We appreciate your comment. We modified the line 21 as follow:

PRIMARY AND SECONDARY OUTCOME MEASURES: Ratio of the number of WREI.

Participants:

Line 26 :

“ included all workers insured by one such company “: why this one? Is this company different from other companies (e.g. is the largest insurance, or other)? Is it possible to introduce

here, (and explain better in the Methods section)?

RESPONSE: We appreciate your comment. IBERMUTUA has workers insured along all Spanish regions, because of that its database is very complete and representative. Another feature of its database is that the number of insured and the number of workers in Spain has the same trend throughout the period time. We have wide the explanation. You can find it in red:

PARTICIPANTS: In Spain, all workers are insured by a labor insurance company that provides cover in the event of work-related accidents. In this study, we have included all workers insured by one of these insurance companies, Ibermutua, with workers in all areas of Spain.

Results:

Lines 34-36:

“ The average incidence was 429.75/100,000 working population and 4,273.36/100,000 IBERMUTUA accidents. “ Not clear what these numbers are, and the meaning. Furthermore, introduce “ IBERMUTUA. “ :

RESPONSE: Thanks for your recommendation. We have changed introducing insured and ibermutua in order to clarify this information.

RESULTS: The study included 50,265 WREI in the company over the 10-year period. Most of the injuries occurred in males (44,445; 88.4%), in the 35-44 age group (15,992; 31.8%), and in industry workers (18,899; 42.6%). The average incidence was 429.75 per 100,000 workers insured and 4,273.36 per 100,000 IBERMUTUA accidents (related and not related to eyes).

Lines 36-38:

Suggestion:

better before introduce who:

“ Males, 16- 24 age group and industry occupational sector group have the highest relative risk (RR) and incidence for WREI “ and then the trend to decrease.

RESPONSE: Thank you very much for your suggestion, it has been included in the results on the abstract:

Males, 16-24 age group and industry occupational sector group have the highest relative risk (RR) and incidence for WREI. The incidence of WREI decrease over the study period in all variables.

Conclusions:

Line 41

“ Specific programs for ocular protection and changes in the occupational sector over the 10-year study period” what are the mentioned "specific programs"? Not introduced or explained (here or also in the Discussion or in other Sections)

RESPONSE: Thanks for your comment. We have modified discussion and some other sections as we said before and conclusion as follow:

CONCLUSIONS: Specific and descriptive knowledge of the incidence and relative risk of work-related eye injuries is the first step for designing programs to prevent accidents in the workplace.

Line 29:

Introduce the term WREI

Absent, how long? Is it possible to know the number of working day lost?

RESPONSE: In this study, we have included all the injuries. We have not considered if they implied working day lost or not. At this point in the research, we are trying to give information about how many WREI we have in the active population in Spain and how they evolved during a 10-years period. We will consider your suggestion for futures studies.

STRENGTHS AND LIMITATIONS OF THIS STUDY

“This study covers the largest area and the highest number of workers of those published in Europe to date.”:

We agree that the number is important, but it is also important the representativeness (e.g. was the sample adequately representative of the 4 occupational sectoral sectors? Is there the possibility of selection bias or other bias?

“The long period of study indicates the results are not only due to specific changes in the insured company but rather to changes in Spanish workers”:

can the Authors explain better what “ changes in Spanish workers” what means?

“Even though having the highest number of cases is an advantage, it makes analysis of the database very difficult, which explains why we missed some cases in the different variables”:

on my opinion there are many other limitations, e.g.

- the working activities are only classified as sectors (Agriculture, Industry, etc.), but “Industry” includes hundreds of tasks very different in terms of injury risk;
- how are the Authors confident that IBERMUTUA data be considered representative of the overall phenomenon of eye injury in Spain? Or presented data represent a partial (=biased) scenario?
- the cause and type of trauma were not collected (what eye injuries? foreign bodies? burns? What else?) as were not the consequences (e.g. prognosis, permanent damages, etc.)

RESPONSE: Thank you very much for your comment. Because of editors and your recommendation, we have decided to change this part as follow in the manuscript:

STRENGTHS AND LIMITATIONS OF THIS STUDY:

- Data is collected from IBERMUTUA, the largest mutual insurance company in Spain
- This study has the highest number of workers in a research across Europe.
- This study covers a 10 years period, including an economic crisis during the period studied.
- Data is collected from only one mutual insurance company
- Economic activities have been classified according to CNAE-2009 and not divided into specific groups

Page 4

Line 6:

I suggest to move the ethical aspects at the end of the section.

RESPONSE: Thank you for your suggestion. We have moved it into the abovementioned section.

Line 16:

Please explain what IBERMUTUA is. Public/private company?

Apparently Is only one among different insurance companies, covering about the 6% of all workers. Is it possible a selection of the activities covered (e.g. mainly some specific work sectors), possibly biasing the results?

RESPONSE:

Ibermutua is a mutual insurance company that collaborates with the Spanish Social Security system. Mutual insurance companies are non-profit private associations of business owners which are duly authorized by the Spanish Ministry of Employment and Social Security and registered with the Special Register operated by the said ministry. They aim to collaborate with the management of the Spanish Social Security system under its direction and auspices with members jointly assuming liability for the situations and with the scope established by the law.

In Spain, there are a total of 20 collaborating friendly societies with the Social Security throughout the whole of the country. They are all members of Amat, the Association of Work Accident and Occupational sectoral Illness Friendly Societies of the Social Security.

Founded in 1986, this body carries out "the coordination, representation, guidance, management, promotion, and defense of the general and common interests of friendly societies". Its main activities are their institutional representation and organizing general activities, most notably those related to the promotion of work risk prevention.

IBERMUTUA is the third mutual insurance company in Spain with more than one million insured distributed throughout Spain.

We have included the following explanation:

A descriptive, retrospective and longitudinal study were performed. We analyzed WREI that affects any ocular structure during work time in a mutual insurance company. Study data were provided by IBERMUTUA, a mutual insurance company that collaborates with the Spanish Social Security system. Mutual insurance companies are non-profit private associations of business owners which are duly authorized by the Spanish Ministry of Employment and Social Security and registered with the Special Register operated by the said ministry. They aim to collaborate with the management of the Spanish

Social Security system under its direction and auspices with members jointly assuming liability for the situations and with the scope established by the law. On these companies, medical specialists evaluate work accidents reported by the companies it insures, analyzing the work-related injury and its consequences for insured workers. The study period was from 1st January 2008 to 31st December 2018.

Line 23:

“The area of study covered all regions in Spain including Ceuta and Melilla, comprising an approximate area of 505,983 km² “ The number of km covered is not the relevant parameter here

RESPONSE: Thanks a lot for your comment. We modified the manuscript:

The area of study covered all regions in Spain including Ceuta and Melilla with a population of 46,650,300 in 2018 (10) (latest census).

Line 29:

“ 11,696,259 subjects ... “ and 201,167,800 workers ... “: how were these numbers calculated?

RESPONSE: 11,696,259 were the cumulative insured workers that IBERMUTUA had during the study period (10 years-period). 201,167,800 workers were cumulative Spanish workers at this same period.

We have included a new reference in the bibliography to check the data of the Spanish active population survey. It is marked in red in the text:

In these years, we analyzed 11,696,259 subjects (table 1), all of them IBERMUTUA-insured workers during the study period, and we related them to 201,167,800 workers in Spain (10).

10. Instituto Nacional de estadística (INE). Sección prensa / Encuesta de Población Activa (EPA). Serie histórica (Datos en miles de personas) [Internet]. 2014 [cited 2019 Dec 18]. Available from: https://www.ine.es/prensa/epa_tabla.htm

Page 8

Conclusions

“Specific knowledge of the incidence and relative risk of work-related eye injuries could be essential for designing programs to prevent accidents in the workplace. “ What preventive programs, if the Authors do not tell what are the occupational sectoral activities “at risk”, what are the injuries, and what the causes?

“This study contains the highest number of cases of any published in Europe to date, so the results are significant.”

These conclusion is wrong: the quality of data, not the absolute number, give a significance to a study.

RESPONSE: Thank you for your appreciation. In the same way that conclusions in the abstract, we have tried to be more accurate in our conclusions, rewriting them as follows.

CONCLUSIONS

Specific and descriptive knowledge of the incidence and relative risk of work-related eye injuries is the first step for designing programs to prevent accidents in the workplace.

There is a higher risk of WREI for workers from Industry and Construction when compare to Agriculture and Services. Experience is also an important factor for WREI, having younger workers more risk of suffering WREI.

Comments Reviewer 2:

- COMMENT: Please leave your comments for the authors below The authors wrote " Ibermutua accidents 1,17,9067" in table 1, they should correct this data.

RESPONSE: Thank you very much for your appreciation. It is a mistake; the real number is 1,179,067. We have changed the data as follow:

Table 1: Total cases (N) of IBERMUTUA insured, IBERMUTUA accidents and total WREI (Work-related eye injuries) according to sex, age, and workers' occupational sector. Losses: total number of losses out of the total number of cases (50265) of WREI in all different groups.

TOTAL LOSSES

N % N %

Ibermutua insured 11,696,259

Ibermutua accidents 1,179,067

Spanish workers 201,167,800

WREI 50,265

Sex WREI

Male 44,445 89.3

Female 5,349 10.7

Total 49,794 100 471 0.9

Age group WREI

16-24 4,388 8.8

25-34 14,981 29.9

35-44 15,992 32.0

45-54 10,278 20.5

>55 4,390 8.8

Total 50,029 100 236 0.5

Occupational sector WREI

Agriculture 1,624 3.7

Industry 18,899 42.6

Construction 10,455 23.6

Services 13,394 30.2

Total 44,369 100 5,893 11.7

Comments Reviewer 3:

- COMMENT: I feel competent, after a critical reading of the paper, to propose this article for publication — namely, the very same article I have published related to child injuries over a ten-year period. The results are well statistically processed and more or less expected. The discussion is fair and shows the differences in the data obtained from other studies with critical review and explanation. Article accepted for publication!

RESPONSE: Thank you very much for your appreciation. We will look for your work to read it.

Comments Reviewer 4:

- COMMENT: A thorough editing of the English should be carried out since in several parts of the paper it is very difficult to understand what the authors meant. The paper lack of important information that can help to understand better the aims, the methods and the results of the manuscript. After describing the relevant missing information, the aims and results of the manuscript will become clearer, and the manuscript may be of interest and add relevant information to the scientific literature.

RESPONSE:

Dear reviewer, the manuscript has been checked by a native English teacher, but we have asked for revision again and we have made some changes to make the reading easier.

In our response to your next comments, we will describe the relevant missing information to help to better understand the manuscript.

We appreciate your comments and hope that after doing all the changes you could consider this work of interest.

- COMMENT: Much more explanation about the general health system in Spain, including information on insurance company, will help to understand better the aim of the study, the methods, analysis and results.

The author mentioned IBERMUTUA, but did not described what exactly this is, and this is not clear

especially to non-residents.

Same for IBERMUTUA? What is it?

What is the insurance system in Spain? Does everyone have it? Across all ages? Does it cost money? Does it is obligatory? Does it include only people who work? Does it include people who work in private business? At home? This information is crucial for understanding better the cohort of the study and respectively the results and conclusions.

General description of Spain population can be helpful, especially in the areas that the insurance company cover. Does the study population can represent the population in Spain?

RESPONSE: We appreciate your comment.

Ibermutua is a mutual insurance company that collaborates with the Spanish Social Security system. Mutual insurance companies are non-profit private associations of business owners which are duly authorized by the Spanish Ministry of Employment and Social Security and registered with the Special Register operated by the said ministry. They aim to collaborate with the management of the Spanish Social Security system under its direction and auspices with members jointly assuming liability for the situations and with the scope established by the law.

In Spain, there are a total of 20 collaborating friendly societies with the Social Security throughout the whole of the country. They are all members of Amat, the Association of Work Accident and Occupational sectoral Illness Friendly Societies of the Social Security.

Founded in 1986, this body carries out "the coordination, representation, guidance, management, promotion, and defense of the general and common interests of friendly societies". Its main activities are their institutional representation and organizing general activities, most notably those related to the promotion of work risk prevention.

IBERMUTUA is the third mutual insurance company in Spain with more than one million insured distributed throughout Spain.

We have decided to change for better comprehension of the abstract in the participant's section like this:

PARTICIPANTS: In Spain, all workers are insured by a labor insurance company that provides cover in the event of work-related accidents. In this study, we have included all workers insured by one of these insurance companies, Ibermutua, with workers in all areas of Spain.

And a better explanation in red has been included in methods:

A descriptive, retrospective and longitudinal study were performed. We analyzed WREI that affects any ocular structure during work time in a mutual insurance company. Study data were provided by IBERMUTUA, a mutual insurance company that collaborates with the Spanish Social Security system. Mutual insurance companies are non-profit private associations of business owners which are duly authorized by the Spanish Ministry of Employment and Social Security and registered with the Special Register operated by the said ministry. They aim to collaborate with the management of the Spanish Social Security system under its direction and auspices with members jointly assuming liability for the situations and with the scope established by the law. On these companies, medical specialists evaluate work accidents reported by the companies it insures, analyzing the work-related injury and its consequences for insured workers. The study period was from 1st January 2008 to 31st December 2018.

- COMMENT: General description of Spain population can be helpful, especially in the areas that the insurance company cover. Does the study population can represent the population in Spain?

RESPONSE: Thank you so much for your comment. A general description of Spain population is described in page 4 from lines 22 to 30. The representativeness of the Spanish population is explained in results (page 5 from lines 39 to 44).

According to the last official data from Ibermutua and INE (National Statistics Institute), Ibermutua covered to 1,585,534 of the 22,806,800 workers in Spain in 2018.

In our study, the workers insured by Ibermutua in the 10-years period were the 5.81% (SD \pm 0.221) of the Spanish workers in the same period (page 5, line 39). It is important to highlight that evolution of total Spanish workers and IBERMUTUA insured have the same trend along the study period as figure

1 shows ($p=0.9987$).

- COMMENT: Introduction

The introduction is not detailed enough and does not give enough relevant information that will help understand the purpose of the research and the research methodology.

The author must give more details and describe the health and insurance system so the readers can understand what data could be collected or have been collected.

In the introduction and discussion, a lot of science background is missing. It is not clear what has been done and is known so far in the world and in Spain in particular - and accordingly, it will be possible to understand the purpose of the study and why it is being carried out. (see comments on this in the discussion as well) .

RESPONSE: Thank you so much for your comment. This study is one of the first to be carried out in Spain. Therefore, today there is not much published about it. The main objective of this study was the epidemiological characterization of WREI causing ocular injury in Spain by sex, age and occupational sector over a 10-years period.

Following your recommendation, we have referenced other studies in the world about WREI. We have compared these studies with our study. You can check the new information in red in the discussion.

- COMMENT: Research Methods AND Statistics:

Author should explain how the data were saved (computer system), so it will be possible to understand how injury classification has been made and by whom. What is the difference between ICD and CIE-9-MC?

RESPONSE: thank you for your comment. The explanation of injury classification is on page 4 line 34 to 39. When a worker suffers an accident, he must go to an Ibermutua's medical specialist for an injury's evaluation. This medical specialist has a computer system where he classifies the injury within one of the CIE-9-MC classification. CIE-9MC is the same as ICD, the first one is the acronym in Spanish and the second one in English of International Classification of Diseases. According to WHO, ICD is the foundation for the identification of health trends and statistics globally, and the international standard for reporting diseases and health conditions. This allows making data comparisons in the same location across different periods.

We explain this point in the manuscript as follows.

We studied WREI that affects any ocular structure during work time and in itinere. These injuries were evaluated and classified by medical specialists according to CIE-9-MC classification, correlations with ICD- 10 that's is the new classification. According to WHO, ICD is the foundation for the identification of health trends and statistics globally, and the international standard for reporting diseases and health conditions. This allows making data comparisons in the same location across different periods. Ocular injuries are included in this classification with codes from 360 to 379. Only injuries where any ocular structure was affected as the main injury were included in the study.

- COMMENT: What is the difference between "number of WREI" and "insured/accident per 100,000 population in IBERMUTUA (ratio/100,000 population)". This should be clarified.

RESPONSE: Thanks for the appreciation. We have studied the incidence of WREI per 100,000 population and establish a ratio/100,000 population. We have included two types of data:

1. Insured: they are all IBERMUTUA insured over the study period

2. Accidents: they are IBERMUTUA insured that suffers an accident in the same period.

Results are divided into "INCIDENCE AND RELATIVE RISK (RR) PER 100,000 IBERMUTUA INSURED" and "INCIDENCE AND RELATIVE RISK (RR) PER 100,000 IBERMUTUA ACCIDENTS".

We have modified in the methods to clarify.

STATISTICAL ANALYSIS

Quantitative variables are given as a mean \pm standard deviation (SD). For qualitative variables, absolute and relative frequencies are given in percentages. To standardize data, the relationship between the number of WREI per 100,000 population in IBERMUTUA (ratio/100,000 population) was calculated. IBERMUTUA data was divided into IBERMUTUA insured, which are the total number of

workers insured by IBERMUTUA, and IBERMUTUA accidents. Accidents refer to all the workers insured by IBERMUTUA that have suffered an accident in the 10-year period studied. A relative risk (RR) was computed to check the effects that exist between different groups of sex, age, and occupational sector.

- COMMENT: How RR was calculated?

RESPONSE: To compare different groups in each variable, the lowest incidence per 100.000 population on each group was considered as reference. RR shows how many times more of risk have a worker to suffer an accident regarding the reference. We have added this information in the paper:

A relative risk (RR) was computed to check the effects that exist between different groups of sex, age, and occupational sector. To compare different groups in each variable, the lowest incidence per 100.000 population on each group was considered as reference. RR shows how many times more of risk have a worker to suffer an accident respect the reference.

- COMMENT: It is not clear how the analysis was performed when there are several factors that should be taken into consideration - this issue is not explained in the methods section. For example, when there are several age groups or several risk factors? Author may performed linear regression and uni and multi variable analysis to see what factors influence the prevalence of eye injury and the interaction between these factors.

RESPONSE: Thank you very much for your comment. Although we think that your point is interesting, we have decided just describing injuries by sex (to analyze the different between males and females), by age (according to the Labour, Migrations and Social Security Ministry of Spain) and by sectors (according the National Economic Activities Code (CNAE-2009 in Spain)).

This decision is because we wanted to answer our principal objective: Describe the epidemiological characterization of WREI causing ocular injury in Spain by sex, age and occupational sector over a 10-years period.

Another kind of study will be interesting, and we will consider this recommendation for future studies.

- COMMENT: The way results (table and figures) are presented are not clear. Please present data both in text and tables/figures mostly in %. If men are presented, you do not need to show results for women (100-%men).

Table 1 is very unclear and does not adequately illustrate the results of the study. It is necessary to give relevant information in the table and mostly include percentages.

RESPONSE: We appreciate your comment. We only included percentage on descriptive results of the database (number of men, age groups and occupational sector) but is not possible to give a percentage of incidence or relative risk.

We have included table 1 to make a summary of the first results of the descriptive study. More detailed are given in the text and table 2.

- COMMENT: It would also be interesting to know in each profession how was the sample distribution by age? It will be interesting to know the prevalence of eye injuries in different age groups, especially in men. Is there a significant difference between men and women in the incidence of eye injuries? By age? By profession? The influence of risk factors interaction (gender, profession, age group) will add interest to the paper.

RESPONSE: Thank you very much for your comment.

In this study, the objective was to obtain the differences between sex, age (classifying in age groups) and occupational sector of the workers that have suffered a WREI.

With our analysis, we have obtained important results about the abovementioned data. The results show a higher incidence in men, young people, and the industry sector.

We would analyze data as you suggest in future studies.

- COMMENT: While it is very interesting to see the development by year and whether the number of eye injuries has decreased over the years, it is also interesting to see average results in general - this is especially relevant in the discussion - when the authors describe difficulty comparing their results to other studies.

RESPONSE: Thank you very much for your comment. The average results, in general, are on page 5 lines 34 to 36, 48, 57 on page 6 lines 18 to 20, 37, 46 to 52 and page 7 lines 3 to 10.

In our study, we considered the workers as a study population and we compared them with the different studies in the world. There are no many studies about this population of study and this fact is what makes difficult the comparison.

- COMMENT: Table 2 is not clear

Figures are not clear mainly because several phrases (e.g. tolbermutua) are not explained. Also the unites author used are not clear and it make it difficult to understand.

RESPONSE: We appreciate your comment. We have changed the text in red in the manuscript and table 2 to clarify.

To standardize data, the relationship between the number of WREI per 100,000 population in IBERMUTUA (ratio/100,000 population) was calculated. IBERMUTUA data was divided into IBERMUTUA insured, which are the total number of workers insured by IBERMUTUA, and IBERMUTUA accidents. Accidents refer to all the workers insured by IBERMUTUA that have suffered an accident in the 10-year period studied. A relative risk (RR) was computed to check the effects that exist between different groups of sex, age, and occupational sector.

Table 2: Incidence of WREI over 100,000 insured and 1000,000 accidents and relative risk (RR) of WREI over a 10-year period according to sex, age and sector.

WREI incidence per 100,000 insured WREI incidence per 100,000 accidents RR WREI according to insured RR WREI according to accidents

RR 95% CI RR 95% CI

Sex

Total 425,73 4253,29

Male 680,13 5125,27 6,56 6,38-6,75 2,91 2,83-2,99

Female 103,63 1762,19 REF REF

Age

Total 427,74 4273,36

16-24 years 561,16 5083,65 1,77 1,71-1,83 1,51 1,46-1,56

25-34 years 487,27 4800,23 1,54 1,51-1,57 1,43 1,40-1,46

35-44 years 435,58 4364,94 1,38 1,35-1,41 1,30 1,27-1,33

45-54 years 369,43 3729,40 1,17 1,13-1,21 1,11 1,07-1,15

>55 Years 316,69 3368,01 REF REF

Sector

Total 479,65 4719,61

Agriculture 305,14 4495,75 1,53 1,45-1,61 1,72 1,64-1,81

Industry 1538,18 8050,69 7,73 7,55-7,92 3,83 3,74-3,92

Construction 1381,53 6650,00 6,94 6,77-7,12 2,54 2,48-2,60

Services 198,92 2615,65 REF REF

- COMMENT: Discussion

The discussion should be re-written, in accordance with the research objectives and methods.

RESPONSE: Thank you very much for your appreciation. We decided to change the objectives of the study to accordance the descriptive study:

OBJECTIVE: To describe the epidemiological characteristics and trends of work-related eye injuries (WREI) in Spain over 10-years period by sex, age and occupational sector.

We changed the final part of the introduction:

The main objective of this study was the epidemiological characterization of WREI causing ocular injury in Spain by sex, age and occupational sector over a 10-years period.

We have also changed discussion.

- COMMENT: A comparison of results has been made with research done not only by insurance companies. For example, authors mention several papers while all of them have been done in clinics/hospital etc. e.g. Sahraravand et al., *Acta Ophthalmol.* 2017; Yu TSI, Liu H, Hui K. *Ophthalmology.* 2004. The paper of Gobba et al., 2017; was done in Ophthalmological Emergency Department (OED) of Modena University Hospital, and it is not the same as in this study. Author should separate between studies that were carried out in hospitals or clinics vs. studies that had data from insurance companies. In addition, author must discuss this in discussion and limitation of the study-since the cohort of this study may not represent the actual population that have eye injury (maybe not all the population sue the insurance company).

RESPONSE: Thank you very much for your comment. It was very difficult for us to compare with other studies because the population in all studies are not only workers or not only from an insurance company. However, Gobba et al 2017 studied a sample like ours. We have discussed the differences between our study and other studies in the discussion (page 7, lines 34 to 36 and page 8, lines 7 to 9). We have specified this difference in red in the discussion as follow:

The higher impact on males is similar to other studies where the percentage of eye injuries in males was between 87 and 95.1% (5,14–16). A very similar RR was observed in Modena (Italy) (7:1 male/female ratio) (5), although it was lower in Taiwan (3.99) (14). It is important to highlight that these studies included not only the active population, so results are Eye Injuries but not only related to work.

We have included as a limitation in red at the end of the discussion:

Because of the higher number of data, a certain number of cases in the different variables was missing. These missed cases were not relevant in the sex and age group but were important in occupational sector groups (Table 1). This becomes a limitation of our study and should be taken into account in future research in this area. Another limitation was difficult to compare with other studies where eye injuries are not only related to work, as far as they are carried out in hospital emergency departments.

- COMMENT: If the author will compare results with studies performed in hospitals, he should mention more papers in the area, such as:

- Vaziri, et al., *Ophthalmology.* 2016 April ; 123(4): 917–919
- Stagg et al., *Ophthalmology* 2017;124:720-729
- R. Sterling Haring et al., *Injury, Int. J. Care Injured* 47 (2016) 104–108
- Desai et al., *Eye* (2015) 29, 611–618
- L. C. Northey et al. *Ophthalmic Epidemiology*, 2014; 21(4): 237–246
- El-Mekawey et al *Clinical Ophthalmology* 2011;5 955–960
- Fea et al., *Graefes Arch Clin Exp Ophthalmol* (2008) 246:175–179
- McGwin et al. *Invest Ophthalmol Vis Sci.* 2006;47:521–527
- Cao H, Li L, Zhang M (2012) *PLoS ONE* 7(10)
- And more....

Comparison of different papers and the current study can be presented in a table that includes the different methodology that was used in each study.

Author may discuss some of this paper in the introduction as well Abstract - should be re-written in more details (in relation to the comments in the manuscript). Please give more details in the methods and in the results section.

RESPONSE: Thank you very much for all these references. The manuscript has been rewritten following your recommendations as well as the recommendations made by other reviewers. We have used 3 of the abovementioned references to improve the introduction. We have also rewritten the discussion in red as follow:

INTRODUCTION

The prevalence of ocular injuries in developed countries ranges from 88 to 1,920 out of a 100,000 population (4,5), depending on the origin and the type of ocular injury. León Hernández et al. found that 20.2% of all ocular traumas in Spain in 1991 occurred in the workplace (6). The percentage of ocular injuries related to work changes along with the world from 0.84 to 3.4% (7-9). It depends on the type of population, the medical attention and the type of injury included in the study.

DISCUSSION

The percentage of WREI in our study was lower than Gomez Villa et al. observed in two villages on the island of Mallorca (Spain) (0.84%), Torino (Italy) (1.3%) (7) and much lower than another with a similar number of study cases in USA (3.4%) (9). The difference was maybe due to the smaller area and population (only two villages and 50,851 workers) and the shorter study period (two years) in Mallorca and the population in USA and Torino is not only insured workers.

- This generalized decrease might be the result of unknown specific eye protection plans proposed by the companies and IBERMUTUA. Variation in occupational sector incidence over the study period could be another reason for this decrease. So, sectors with lower risk (agriculture and services) have increased his proportion (81% in 2018 vs 73% in 2008) and this makes that incidence of WREI also decrease in general.

7. Fea A, Bosone A, Rolle T, Grignolo FM. Eye injuries in an Italian urban population: Report of 10620 cases admitted to an eye emergency department in Torino. Graefe's Arch Clin Exp Ophthalmol [Internet]. 2008 Feb;246(2):175–9. Available from:

<https://search.ebscohost.com/login.aspx?direct=true&db=mdc&AN=18183412&lang=es&site=ehost-live&scope=site>

9. Stagg BC, Shah MM, Talwar N, Padovani-Claudio DA, Woodward MA, Stein JD. Factors Affecting Visits to the Emergency Department for Urgent and Nonurgent Ocular Conditions. Ophthalmology [Internet]. 2017/01/31. 2017 May;124(5):720–9. Available from:

<https://pubmed.ncbi.nlm.nih.gov/28159379>

21. McGwin Jr G, Hall TA, Xie A, Owsley C. Trends in Eye Injury in the United States, 1992–2001. Invest Ophthalmol Vis Sci [Internet]. 2006 Feb 1;47(2):521–7. Available from:

<https://doi.org/10.1167/iovs.05-0909>

VERSION 2 – REVIEW

REVIEWER	Einat Shneor Hadassah Academic College, Jerusalem, Israel
REVIEW RETURNED	25-Apr-2020

GENERAL COMMENTS	General and major comments: The authors have addressed most of the comments given to them and now the manuscript is much more understandable and clearer. Thank you for this. I think the main advantage of the paper is that it contains a lot of subjects, data, and is over many years. As a result, profound analysis should be expected. Therefore the authors should not only provide epidemiological descriptive information, but also to discuss at the risk factors for eye injury in Spain. The conclusions and discussion of the present manuscript are very general, although the authors can greatly raise the specificity of the paper. The relation between the 3 groups of data (sex, age and sector) and the interaction between them, as well as the type of injury can add to the impact of the paper. The authors said they might do this in the
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	<p>future, but since they already have the data, why not to add it to the current paper? The impact of this data may add to the strength of the paper and may influence the health policy.</p> <p>The way the results are presented should be changed. It's unclear why the authors use Ibermutua accident and Ibermutua insured separately? There is a connection between them. What is interesting is the relation between these two parameters. This means that the percentage of people with eye injuries should be calculated as relative to the percentage of those who are insured. Thus, table 2 and figures 2 and 3 can be changed (and the text accordingly). In this way the comparison between the different groups will be clearer. For example, Figure 2A and Figure 3A can be combined, illustrating the percentage of women and men who have eye injuries relative to the percentage of insured women and men.</p> <p>Minor comments:</p> <p>Results:</p> <p>page 29 lines 18-27: please provide statistical evidence for these conclusions.</p> <p>page 29 lines-34-37: Please rephrase this sentence because it is unclear</p> <p>Discussion:</p> <p>Please include in the first paragraph of the discussion, a detailed summary of the results.</p> <p>Page 32 line 7-8 and also in page 33 line 5: The authors mentioned that the results are influenced by work experience and that younger people are less experience and therefore are more injured. But how can they know? Can we be sure that older people are working more years in the profession? Do the authors have data on how many years of experience the participants have? Or do the authors only have data on the subject's age? This has to be clarified.</p> <p>Page 42 line 32: Please rephrase this sentence</p>
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VERSION 2 – AUTHOR RESPONSE

Reviewer(s)' Comments to Author:

RESPONSES TO REVIEWER'S COMMENTS:

Comments Reviewer 4:

Reviewer: 4

Reviewer Name: Einat Shneor

Institution and Country: Hadassah Academic College, Jerusalem, Israel

Please state any competing interests or state 'None declared': None declared

Please leave your comments for the authors below

General and major comments:

• COMMENT: The authors have addressed most of the comments given to them and now the manuscript is much more understandable and clearer. Thank you for this.

RESPONSE: Thank you very much for your appreciation. We have worked on your new suggestions. We wait for you to find the manuscript suitable for publication after these new changes.

• COMMENT: I think the main advantage of the paper is that it contains a lot of subjects, data, and is over many years. As a result, profound analysis should be expected. Therefore the authors should not only provide epidemiological descriptive information, but also to discuss at the risk factors for eye injury in Spain. The conclusions and discussion of the present manuscript are very general, although the authors can greatly raise the specificity of the paper. The relation between the 3 groups of data (sex, age and sector) and the interaction between them, as well as the type of injury can add to the impact of the paper. The authors said they might do this in the future, but since they already have the data, why not to add it to the current paper? The impact of this data may add to the strength of the paper and may influence the health policy.

RESPONSE: Thank you very much for your comments. Based on that we have used a multiple logistic regression test to analyse the relation between the 3 groups of data.

1. We have added in methods this analysis:

A multiple logistic regression has been used to analyse the relationship between WREI and sex, age and occupation. The risk of suffering WREI was calculated from the Odds Ratio (OR) obtained from this analysis taking as the reference the group with the lowest incidence.

2. We have changed also the results, adding a new section with the multivariate analysis as follows:
INTERACTION ANALYSIS BETWEEN SEX, AGE AND OCCUPATION

Table 3 shows how according to the results of multiple logistic regression analysis, there was significant relationship between WREI and sex, age and occupation. Males have 80.11% (95% CI 79.61-80.61) more risk to suffer WREI than females. In addition, 16-24 age group showed the highest risk of suffering WREI compared to the lowest group (>55 years) (64.15% (95% CI 63.11-65.19)) followed by 25-34 age group (60.79% (CI 95% 59.93-61.65)), 35-44 age group (58.24% (CI 95% 57.37-59.11) and finally 45-54 age group (55.45% (CI 95% 54.50-56.39)).

Workers from the Industry group had the highest risk of suffering WREI compared with those from Services group (85.29% (CI 95% 85.00-85.57)), they were followed by workers from the Construction (80.85% (CI 95% 80.43-81.26)) and Agriculture sectors (53.50% (CI 95% 52.33-54.93)).

Table 3. Relationship between WREI and study variables according to multivariate logistic regression analysis

OR (95% CI) p-value

Sex

Male 4,030(3,904-4,159) < 0,001

Female REF REF

Age (years)

16-24 years 1,790(1,711-1,873) < 0,001

25-34 years 1,551(1,496-1,608) < 0,001

35-44 years 1,395(1,346-1,446) < 0,001

45-54 years 1,245(1,198-1,293) < 0,001

>55 Years REF REF

Occupation

Agriculture 1,151(1,098-1,219) < 0,001

Industry 4,222(4,111-4,336) < 0,001

Construction 5,799(5,668-5,933) < 0,001

Services REF REF

3. We have included the interaction between sex, age, and occupation in the discussion, and made a deep analysis of risk factors as follows:

DISCUSSION

Of all the long-term studies we have observed in Europe, this is the one which covers the largest area and the highest number of cases. The close relationship between Ibermutua-insured workers and the evolution in the number of workers in Spain ($p=0.9987$) indicates the importance of our data analysis. The highest WREI incidence per 100.000 Ibermutua insured/accidents and the highest relative risk (RR) was observed in males, aged between 16-24 that worked in the Industry sector. The evolution of WREI incidence per 100.000 insured/accidents over the study period showed a decrease in all the groups (both sexes and all ages and sectors)

The percentage of WREI in our study was lower than Gomez Villa et al. observed in two villages on the island of Mallorca (Spain) (0.84%) (9), Torino (Italy) (1.3%) (10) and much lower than another with a similar number of study cases in the USA (3.4%) (11). The difference was maybe due to the smaller area and population (only two villages and 50,851 workers) and the shorter study period (two years) in Mallorca and the population in the USA and Torino is not only insured workers.

The total incidence of WREI falls between the values of other studies (4,5) and is very similar to that found by Karlsen et al. in Wisconsin (USA) in 1986 (423/100,000) (12). However, in all of these studies, the incidence does not relate exclusively to work-related injuries. If we compare only with WREI, in our study we observe higher incidence than in Hong Kong (around 125/100,000) (13). However, it is very difficult to compare these two values because the Hong Kong study covered a period of only 3 months.

The higher impact on males is similar to other studies where the percentage of eye injuries in males was between 87 and 95.1% (5,14–16). A very similar RR was observed in Modena (Italy) (7:1 male/female ratio) (5), although it was lower in Taiwan (3.99) (14). It is important to highlight that these studies included not only the active population, so results are Eye Injuries but not only related to work. This higher impact on males might be due to the different occupations in each group too. In the last quarter of 2018 in Spain, there were 2.8 times more men than women working in Industry and 10.6 times more in Construction. These are the two workers' occupational sectors where the highest WREI incidence was observed in our study. However, there were 1.054 million more female workers in Services (17).

35-44 was the most affected age group in our study. Our data match those found in an area in the southwest of China (16). The highest percentage observed in other studies was in the 25-34 age group in Western Turkey (15) and the 16-24 age group in Modena (Italy) (5). However, we observed more incidence of WREI for 100,000 insured in the lowest age group (16-24) in our study, and this incidence decreases with age. We only analyzed the workers' population, and we think this is why we found more eye injuries in the lowest age group. These workers have less experience and perform more manual jobs too. Our results suggest that work-experience plays a protective role in Spanish workers as well as in other countries (5, 15, 18).

As in other studies (5), we observed the highest incidence and percentage of WREI in Industry workers. Agriculture was the most affected group in other studies (19,20) but in all of them, Services was the least affected group. This is due to the lower risk of trauma or other external agents that can affect Services workers.

The multiple logistic regression analysis to study the interaction of the different variables, confirmed the results from the descriptive analysis. So, the highest incidence was observed in younger workers (aged between 16 and 24) and in males, confirming results from previous studies (21).

When we analyzed the evolution of WREI for 100,000 Ibermutua insured/accidents, we standardized data and eliminated WREI due to population variation. Therefore, we need to find reasons for the reduction in WREI in all study variables. This generalized decrease might be the result of unknown specific eye protection plans proposed by the companies and Ibermutua. Variation in occupational sector incidence over the study period could be another reason for this decrease. So, sectors with lower risk (agriculture and services) have increased his proportion (81% in 2018 vs 73% in 2008) and

this makes that incidence of WREI also decrease in general.

There are no studies that compare WREI for accidents only (as opposed to total population). We considered it worth making this comparison to find out the mechanism and the importance that WREI have in total accidents in Spain. Using this data could make it easier to devise specific programs aimed at reducing ocular accidents and the associated costs.

The high number of data of our database makes that a certain number of cases in the different variables was missing. Because of that, we don't have the same number of cases in all variables. These missed cases were not relevant in the sex and age group but were important in occupational sector groups (Table 1). This becomes a limitation of our study and should be taken into account in future research in this area. Another limitation was the difficulty to compare with other studies where eye injuries are not only related to work, as far as they are carried out in the hospital's emergency departments.

4. Finally, we have changed also conclusion according to the new results exposed and the discussion:

CONCLUSIONS

There is a higher risk of WREI for workers from Industry and Construction when compare to Agriculture and Services. Our results suggesting that experience is also an important factor for WREI, because younger workers showed more risk of suffering WREI. With these results, the main risk factors for suffering WREI was to be male, to be young and less experienced and work in manual task.

According to these results, specific protection programs for higher protection in Industry and Services sectors should be proposed. We suggest the implantation of protective glasses and face shields in Industry workers and visual ergonomic measures or instilling eye drops in workers of the services sector.

• COMMENT: The way the results are presented should be changed. It's unclear why the authors use Ibermutua accident and Ibermutua insured separately? There is a connection between them. What is interesting is the relation between these two parameters. This means that the percentage of people with eye injuries should be calculated as relative to the percentage of those who are insured. Thus, table 2 and figures 2 and 3 can be changed (and the text accordingly). In this way the comparison between the different groups will be clearer. For example, Figure 2A and Figure 3A can be combined, illustrating the percentage of women and men who have eye injuries relative to the percentage of insured women and men.

RESPONSE: Thank you very much for your suggestion.

We have studied the evolution of WREI through incidence, analyzing WREI incidence over the total of workers insured by Ibermutua and over that total of Ibermutua accidents. The last would be all Ibermutua insured that suffered an accident over the period.

We have chosen this kind of analysis to standardized data and eliminated changes in WREI due to fluctuations in population.

However, we understand that the percentage of people with eye injuries calculated as relative to the percentage of those who are insured could improve the understanding of the results, so we have added these values in table 2 as follows:

Table 2: Incidence of WREI over 100,000 insured and 1000,000 accidents and relative risk (RR) of WREI over a 10-year period according to sex, age and sector.

WREI incidence per 100,000 accidents Risk percentage of WREI (%) WREI incidence per 100,000 accidents RR WREI according to insured RR WREI according to accidents

RR 95% CI RR 95% CI

Sex

Total 425.73 4253.29

Male 680.13 80.11% (95% CI 79.61-80.61) 5125.27 6.56 6.38-6.75 2.91 2.83-2.99

Female 103.63 REF 1762.19 REF REF

Age

Total 427.74 4273.36

16-24 years 561.16 64.15% (95% CI 63.11-65.19) 5083.65 1.77 1.71-1.83 1.51 1.46-1.56

25-34 years 487.27 60.79% (CI 95% 59.93-61.65) 4800.23 1.54 1.51-1.57 1.43 1.40-1.46

35-44 years 435.58 58.24% (CI 95% 57.37-59.11) 4364.94 1.38 1.35-1.41 1.30 1.27-1.33

45-54 years 369.43 55.45% (CI 95% 54.50-56.39). 3729.40 1.17 1.13-1.21 1.11 1.07-1.15

>55 Years 316.69 REF 3368.01 REF REF

Sector

Total 479.65 4719.61

Agriculture 305.14 53.50% (CI 95% 52.33-54.93) 4495.75 1.53 1.45-1.61 1.72 1.64-1.81

Industry 1538.18 85.29% (CI 95% 85.00-85.57) 8050.69 7.73 7.55-7.92 3.83 3.74-3.92

Construction 1381.53 80.85% (CI 95% 80.43-81.26) 6650.00 6.94 6.77-7.12 2.54 2.48-2.60

Services 198.92 REF 2615.65 REF REF

Regarding the figures, we have made some proofs and the have so much data that they are difficult to read. Finally, we decided to leave as they are now.

Minor comments:

Results:

• COMMENT: page 29 lines 18-27: please provide statistical evidence for these conclusions.

RESPONSE: Thank you very much for your comment. We have studied the trend over the study period in Spanish workers and Ibermutua insured in all occupational groups. This analysis shows a very similar trend in Industry and Services, with no statistical differences ($p > 0.05$). However, this trend changes in Construction and Agriculture where statistical differences were observed ($p < 0.05$). It had been explained in red in results as follows:

Workers insured by Ibermutua constituted an average of 5.81% (SD ± 0.221) of all workers in Spain, and the rate of change between workers insured in Ibermutua and total workers in Spain in the study period did not show statistically significant differences ($p = 0.9987$) (Figure 1). This rate of change did not show statistically significant differences in services ($p = 0.070$) and industry ($p = 0.453$). The decrease in Spanish construction workers was statistical significance higher ($p = 0.009$) than Ibermutua construction insured over the study period, however, the trend is very similar. This trend was statistical significance different ($p = 0.02$) in Agriculture where Spanish workers decrease against Ibermutua insured who increased its number.

• COMMENT: page 29 lines-34-37: Please rephrase this sentence because it is unclear

RESPONSE: Thank you very much for your appreciation. We have changed this sentence as follow: The incidence of WREI over the 10 years was 680.12 per 100,000 insured for males and 103.63 per 100,000 insured for females. Therefore, males had 6.56 (95% CI 6.38-6.75) times more relative risk of suffering WREI than females (Table 2). If we analyze the evolution over the study period, a decrease in the incidence in both groups was observed. This decrease was statistically significant bigger in males than females ($p = 0.00027$) (Figure 2a).

Discussion:

• COMMENT: Please include in the first paragraph of the discussion, a detailed summary of the results.

RESPONSE: Thank you very much for your suggestion. We have included this detailed summary in the discussion as follows:

Of all the long-term studies we have observed in Europe, this is the one which covers the largest area and the highest number of cases. The close relationship between Ibermutua-insured workers and the evolution in the number of workers in Spain ($p = 0.9987$) indicates the importance of our data analysis. The highest WREI incidence per 100.000 Ibermutua insured/accidents and the highest relative risk (RR) was observed in males, aged between 16-24 that worked in the Industry sector. The evolution of WREI incidence per 100.000 insured/accidents over the study period showed a decrease in all the

groups (both sexes and all ages and sectors)

• COMMENT: Page 32 line 7-8 and also in page 33 line 5: The authors mentioned that the results are influenced by work experience and that younger people are less experience and therefore are more injured. But how can they know? Can we be sure that older people are working more years in the profession? Do the authors have data on how many years of experience the participants have? Or do the authors only have data on the subject's age? This has to be clarified.

RESPONSE: Thank you very much for your note. We don't have data about how many years are each worker in his/her profession. We only have data about the subject's age, but we suggest that older people have more experienced and a bigger experience decreases the risk of suffering an accident because of our results. This affirmation is supported by other studies cited in the manuscript (5, 15). We think we should clarify this point following your appreciations, so we have changed discussion as follows:

35-44 was the most affected age group in our study. Our data match those found in an area in the southwest of China (16). The highest percentage observed in other studies was in the 25-34 age group in Western Turkey (15) and the 16-24 age group in Modena (Italy) (5). However, we observed more incidence of WREI for 100,000 insured in the lowest age group (16-24) in our study, and this incidence decreases with age. We only analyzed the workers' population, and we think this is why we found more eye injuries in the lowest age group. These workers have less experience and perform more manual jobs too. Our results suggest that work-experience plays a protective role in Spanish workers as well as in other countries (5, 15, 18).

18. Knyazer B, Bilenko N, Levy J, Lifshitz T, Belfair N, Klemperer I, Yabe T. Open globe eye injury characteristics and prognostic factors in Southern Israel: A retrospective epidemiologic review of 10 years experience. *Isr Med Assoc J.* 2013 Mar; 15(3):158-62

And we explain better in conclusions as follows:

CONCLUSIONS

There is a higher risk of WREI for workers from Industry and Construction when compare to Agriculture and Services. Our results suggesting that experience is also an important factor for WREI, because younger workers shown more risk of suffering WREI. With these results, the main risk factors for suffering WREI was to be male, to be young and less experienced and work in manual task. According to these results, specific protection programs for higher protection in Industry and Services sectors should be proposed. We suggest the implantation of protective glasses and face shields in Industry workers and visual ergonomic measures or instilling eye drops in workers of the services sector.

Page 42 line 32: Please rephrase this sentence

RESPONSE: Thanks a lot for your comment. We have changed the sentence of page 32 line 42 as follows:

The high number of data of our database makes that a certain number of cases in the different variables was missing. Because of that, we don't have the same number of cases in all variables. These missed cases were not relevant in the sex and age group but were important in occupational sector groups (Table 1).

VERSION 3 – REVIEW

REVIEWER	Einat Shneor Hadassah Academic College, Jerusalem, Israel
REVIEW RETURNED	15-Jul-2020

GENERAL COMMENTS	General and major comments:
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The authors have addressed most of the comments given to them, however main problem in statistical analysis still exists. As I mentioned before, the main advantage of the paper is that it contains a lot of subjects, data, and is over many years. More complicated analysis can assure significant results and conclusions. Although the author performed univariable and multivariable analysis, the results of this analysis are not clearly demonstrated. The author showed the relation between the 3 groups of data (sex, age and sector) to WREI but he did not show the interaction between them.

For example:

- It will be interesting to know in each profession and each age group how many men and women was? Is there a significant difference between men and women in WREI? By age? By profession? By both profession and age?

- It will be interesting to know, if, for example Men in a specific age group, and a specific sector has higher risk then men in a different age group but same or different sector.

- Do men in a specific age group, and specific sector has higher risk then women in a same/different age group and/or same/different sector....and more.

Regarding to this comment, the analysis in table 3 is not clear. Can the author explain in more detail what he has done? Does age is a risk factor? Does sex and occupation? Does the interaction between sex and age is a risk factor? If yes, which age and sex has the higher risk factor? And so on...

To examine this, a series of multivariate logistic regressions should be performed to determine the odds ratio (OR) of the research variables, with the predictive variables in each regression model including patient age, gender and sector (for each injury type-does author has this data?) and the interaction between them. I recommend the author will look on the Zimmerman et al., 2019 paper (or other similar papers that include multivariable analysis and the interaction between parameters):

<https://onlinelibrary.wiley.com/doi/full/10.1111/opo.12600> .

Organizing a new table that will include all this information is valuable for understanding better the results of this study.

In the discussion, author mentioned " The highest WREI incidence per 100.000 Ibermutua insured/accidents and the highest relative risk (RR) was observed in males, aged between 16-24 that worked in the Industry sector. " This is not seen in the table. Has the author did performed the interaction between parameters? .

In addition, the type of injury is not described at all, although it can add a lot to the impact of the paper.

I do not understand the author replay for the comment I gave in my last review: "The way the results are presented should be changed. It's unclear why the authors use Ibermutua accident and Ibermutua insured separately? There is a connection between them. What is interesting is the relation between these two parameters. This means that the percentage of people with eye injuries should be calculated as relative to the percentage of those who are insured."

	<p>Can you please answer it again?</p> <p>Minor comments:</p> <p>Introduction- line 18 -write full name first time for WREI</p> <p>Introduction- line 50-54: if this is the importance of the paper-it should be discussed in detail in the discussion and should be add to the abstract as well.</p> <p>Results -Line 10- " The average age was 38.62 ±10.57 and the majority of all injuries occurred in the 35-44 age group (15,992; 32.0%)." Please add p value</p> <p>Results - Line 14- "the most affected group "- Please add p value</p> <p>Results - Many times the author repeated the numbers that are described in the table. For example, in lines: page 30 52-54, page 31 lined 3, line 9-10,18-22, 42-46...and more... There is no need for that. In text the main outcome should be mentioned.</p> <p>Table 2: 2 columns have the same title: WREI incidence per 100,000 accidents</p> <p>Discussion and conclusions:</p> <p>Page 33 Line 41- "These workers have less experience and perform more manual jobs". Please add the word "may" after the word "workers"</p> <p>Author added the impact of this paper to main conclusions, however more analysis can be done, and respectively the conclusions will be more specific and accurate.</p>
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