PROBLEMS AND OUTLOOK OF RESEARCH ACTIVITIES IN KAZAKHSTAN

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ABSTRACT

Performance evaluation of scientific work on regional and individual levels can be achieved by the using scientometric methods of a quantitative analysis of bibliographic information available in such databases as Science Citation Index (SCI). Unfortunately, Kazakhstan scientific journals have not been included yet in the Thomson Reuters Corp. register of periodicals, that substantially distorts the actual national scientometric indexes. The analysis of Database "National Citation Reports" (Kazakhstan), which correlated with a contribution of Kazakhstan into the world science development, has shown the low level of research activities of Kazakhstan scientists on international arena. So, the share of international publications of Kazakhstan in the global flow is equal to 0.021% (1044 doc.) that corresponds to the 87th place in the general list of countries of 177 names. Subject to the ranking of countries into groups by the number of the published works, Kazakhstan is referring to the group of 46 countries having 1000 - 10000 publications over 5 years, of which 8.6% in medicine. In this article the use of statistics and appropriate software by the authors of original articles in such journals as recommended by the Kazakh National Centre for Scientific & Technical Expertise (NCSTE) and included in the Database elibrary.kz was evaluated. Research was conducted according to Research Report, due to which a research design and statistical analysis methods were estimated. In the rating of the research design, the authors of articles mostly used as follows: description of a series of cases – 63.2%, description of the individual cases – 27.1%, and description of specific cases – 9.1%. A scope of selection in Section "Research Methods" was only calculated in 21.8% of cases, and in 63.9% of cases there was no description how the selection was carried out. Methods of analytical statistics were used in the 46.0% of cases. And there were references to the program package in use only in 17.5% of works. Thus shown that non-compliance with international standards in the preparation of scientific papers, primarily statistical requirements directly affect the quality and ratings of domestic articles.

UDC CODE & KEYWORDS

■ UDC: 615.1 ■ Statistical research methods ■ Scientific ranking of countries ■ Research design

INTRODUCTION

Scientometrics and bibliometriya is qualitatively new form of analysis and processing of scientific literature attract more attention to assess a science development level, the performance of individual researchers and an importance factor for domestic periodicals. For this purpose can be use a quantitative analysis of bibliographic information available in such databases as Science Citation Index (SCI).

In this case, some criteria have come to the fore such as the number of publications in the journals to be reviewed and a citation index for publications of a scientist. Because a citation index for individual publications of a scientist is difficult enough to determine, those publications in periodical scientific publications are fixed on, which have an impact factor (IF). Under the impact factor, a level of journals, periodicals, and quality of articles published therein are evaluated, a financial support is provided to researchers and persons are employed. First of all, that is referred to the "western" scientific community. However, the impact factor is becoming more important in Kazakhstan as well instead of the criterion of number published articles.

Research methods

We have analyzed some Kazakhstan journals as recommended by the Education & the Science Supervision Committee.

Research was conducted according to Research Report, due to which a research design and statistical analysis methods were evaluated.

The passport part included criteria such as name of a journal, its specifics (public health, clinical medicine, pharmaceutical medicine and others), publication number, date of publication, and the number of authors as per their places of work.

Research type was assessed under the following criteria: review, meta analysis, information on conferences, obituaries, introduction of laureates, original research and others.

Research design was determined under the following criteria: name of research (randomized controlled study, cohort study, case control study, crosses analytical cases, description of a series of cases, and specific case description).

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Statistical analysis methods were determined under the following criteria:

- Selection calculation methods.
- Application of statistical treatment methods (manual handling, treatment with statistical program package MS Excel, SPSS, Statgraphics, SAS).
- What statistical methods were applied to process data: P Value, arithmetic average, standard error of arithmetic average, mean-square deviation, geometric average, harmonic average, medians, quartiles (percentiles), frequencies and portions, confidence intervals (either for portions, or for the average), whether the normalcy of distribution was checked up or not (as per Shapiro-Wilk Test or Kolmogorov-Smirnov Test), Nonpaired Student's Test, Paired Student's Test, Bonferroni correction for multiple comparisons, Mann-Whitney Test, Paired Sample Wilcoxon Test, single-factor analysis of variance, Kruskal-Wallis Test, variance analysis of paired observations, Friedman Test, Pearson's Correlation Coefficient, Spearman's Rank Correlation Coefficient, Kendall's Rank Correlation Coefficient, unidimensional (simple, unifactor) linear regression analysis, multidimensional (multivariate, multi-factor) linear regression analysis, Pearson's Chi-Squared Test, whether a sample size calculation is given in Section "Methods" or not; logistic regression analysis, survival tables, survival analysis by Kaplan-Meier Method, Log-Rank Test and its analogues (Gehan`s Wilcoxon Test and Taron-Vare Test), Coke's proportional hazards analysis (Coke's Regression, characteristic curves (ROC-Curves), time series analysis (any kind), mathematical modeling (any, if the same does not comply with the above description).

Journals to conduct research were selected by the mass method over 2011 (4 publications per 1 year) according to the following inclusion and exclusion criteria:

1. Journals included in the list of such ones as recommended by the Education & the Science Supervision Committee, in a total of 44 journals.
2. Of which such journals as included in Database elibrary. kz, freely available on an online basis, recommended by the National Centre for Scientific & Technical Expertise (NCSTE). In total there were 8 journals as pertaining to public health on Web Site elibrary. kz: of which two journals were freely available on an online basis. For reasons of ethics, names of the journals will not be mentioned. (Ophthalmological journal of Kazakhstan, Pediatric journal of Kazakhstan, research was conducted in January, 2012).

The total population was 189 articles. Only original works were analyzed, in total 133 articles (70.4% of the total population volume). Reviews, obituaries, information on international conferences, reports on the Dissertation Committee work - in total 56 articles (29.6% of the total population) where statistical analysis methods were not used nor were taken into account.

A Research Report was prepared by us, due to which a research design and statistical analysis methods were evaluated.

Research Report

In total, 133 articles were analyzed. The number of the authors in one article was on the average 2 persons. As per the places of work, most often members of research institutes published their articles – 116 works, that is 87.2%. The most active were persons from Almaty – 54 works, that is 40.6%. Quantity of the published works by the authors from Atyrau, Karaganda, and the South Kazakhstan Oblast was up to 13 works from each region, each by 9.8%. From the authors from Uralsk, Pavlodar, Taldykorgan and Aktobe 6 works were approved and published, that is 4.5% for each region. Besides, there were works from the CIS countries, in particular, from Baku (Azerbaidzhan) – 7 works (5.3%).

In 11 (8.3%) of cases, there were scientific works with the lack of full information on the author (name of organization, city/town, contact information etc. were not available). Just 23 (17.3%) of works included references to the program package in use. From among the above-mentioned programs, most often the researchers applied MS Excel – in 11 cases, that is 47.8%; SPSS in 7 cases, that is 30.4%, Statgraphics – in 4 cases, that is 17.4%; and SAS – 1 (4.3%). Though ac-cording to some authors the MS Excel Program application is the least successful as it does not allow the researcher to check up the type of data distribution and has just parametric statistical methods [6]. In the evaluation of a research design, most often the authors of the articles used as follows: description of a series of cases – 84 (63.6%) cases, case control study – 37 (27.1%), specific case description – 13 (9.8%). Randomized controlled studies, cohort studies, and cross analytical cases was not used by the authors. The selection size in Section "Research Methods" was calculated just in 29 (21.8%) of cases, in 85 (63.9%) of cases there was no description how the seat selection was done, and in 18 (13.5%) of cases there was no selection of all that is not admissible in the conduct of research and may lead to the deliberately false results. Methods of analytical statistics were used in 61 works, that is 46.0% and included as follows: Student Criterion was used in 24 works (39.3%); Correlation Analysis in 22 (36.1%) works; Regression Analysis – in 9 (15.4%), and Variance Analysis – in 6 (9.8%). In 30 (49.2%) of cases, a statistical method was not specified that allowed the reader to doubt the value of the said research. In relation to the Student Criterion application, none of the works included the check of all the three conditions required for the application of the same: 2 groups, the normalcy of distribution, and variance equality. Statistical methods such as: confidence intervals for shares, for mean values; normalcy of distribution (as per Shapiro-Wilk or Kolmogorov-Smirnov criteria), Bonferroni Correction for Multiple Comparisons; Mann-Whitney Test, and Wilcockson Criterion, single-factor analysis of variance, Kruskal-Wallis Test, variance analysis of paired observations, Friedman Test, Pearson's Correlation Coefficient, Spearman's Rank Correlation Coefficient, Kendall's Rank Correlation Coefficient, unidimensional (simple, unifactor) linear regression analysis, multidimensional (multivariate, multi-factor) linear regression analysis, Pearson's Chi-Squared Test, whether a sample size calculation is given in Section "Methods" or not; logistic regression analysis, survival tables, survival analysis by Kaplan-Meier Method, Log-Rank Test and its analogues (Gehan`s Wilcoxon Test and Taron-Vare Test), Coke's proportional hazards analysis (Coke's Regression, characteristic curves (ROC-Curves), time series analysis (any kind), Mathematical modeling of the data were not used in any of the articles, which suggests that domestic authors posses a quite weak knowledge of how to apply statistical methods in their publications.

Conclusion

The critical analysis of scientific publications is not a scientific novelty, which is proved by the conducted foreign and domestic research where there is a sufficient evidence that errors may occur in the planning, designing, analysis and interpretation of statistical data [12,13]. The negative aspect is that there is actually no literature that could demonstrate a miscalculation and general shortcomings of computer programs [7]. Though some data such as the use of Benford's initial data in biomedical testing is studied very well [8]. The only conclusion is that all research with a critical analysis of scientific publications for the correctness of the use of statistical methods is intended to provide practicing physicians with qualitative and reliable information.

The detected errors and shortcomings in the use of statistical research methods in Kazakhstan articles provide strong evidence of the necessity to revise the «statistical policy» by the editors of domestic journals.

At the same time authors of scientific articles should develop their statistical and computer competence, knowledge of English and upgrade skills in the field of planning, organization, correct analysis and interpretation of findings as required for the critical study of their own publications by literary searches in leading journals. Only the integrated solution of this problem will help Kazakhstan's scientists to take their rightful place at the international scientific community.

Competing Interests

The authors state that they have no competing interests.

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