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The Use of Research Method in Top Health Sciences Research Article: A Systematic Review

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Abstract: The definitions of scientific research provided in several books state that it is a logical or rational process based on the systematic collection and analysis of data. This definition has the advantage of emphasizing the importance of the research method design. However, there is no consensus on how research methods should be conceptualized. There is no consensus in health sciences on what constitutes a research method. Very few understand the design of the different sections method and their interrelationships that may influence the result and useful research. Consequently, this review provides an overview of all methodological reports used in a sample of 103 leading articles published between 2016 and 2019 in the health sciences discipline, including medicine, nursing, health professions, dentistry, and veterinary medicine. It indicates that quantitative research is widespread, and observational studies, whether clinical or epidemiological, remain highly exploited in all disciplines. Despite the classification of the studied articles, there are gaps in the sampling section. This work highlights the application and design of research methods used in different disciplines. Thus, their result can determine the impact on health as a science and further research on the application and performance in the research method design. In addition, the results can prompt the rigor and compliance with methodological standards in each method subsection and put under the microscope the under-use of some research methods.

Keywords: health sciences, research method, research design, systematic review, research rigor.

顶级健康科学研究文章中研究方法的使用：系统评价

摘要：几本书中对科学研究的定义表明，它是基于系统收集和分析数据的逻辑或理性过程。这个定义的优点是强调了研究方法设计的重要性。然而，对于如何将研究方法概念化，并没有达成共识。健康科学对什么构成研究方法没有达成共识。很少有人了解可能影响结果和有用研究的不同部分方法的设计及其相互关系。因此，本综述概述了 2016 年至 2019 年间在健康科学学科（包括医学、护理学、卫生专业、牙科和兽医学）发表的 103 篇主要文章样本中使用的所有方法学报告。它表明定量研究很普遍，而观察性研究，无论是临床研究还是流行病学研究，在所有学科中都得到了高度利用。尽管所研究的文章进行了分类，但在抽样部分仍存在差距。这项工作突出了在不同学科中使用的研究方法的应用和设计。因此，他们的结果可以确定作为一门科学对健康的影响，并进一步研究研究方法设计中的应用和性能。此外，结果可以提示每个方法小节中方法学标准的严谨性和符合性，并将某些研究方法的使用不足置于显微镜下。

关键词: 健康科学、研究方法、研究设计、系统评价、研究严谨性。

Received: August 15, 2021 / Revised: October 20, 2021 / Accepted: November 17, 2021 / Published: December 30, 2021

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1. Introduction

According to [24], research is a process of acquiring knowledge based on the collection and analysis of empirical data to describe, explain, predict and control phenomena. This definition has highlighted the importance of methods in conducting scientific research.

Particularly in health, the growth and need for scientific research on which to base decisions [9] remain crucial because it can directly or indirectly affect the quality of human life [12].

Thus, when conducting research, a method is considered appropriate and effective if applied rigorously in the research process. Descriptions of the elements of the method, such as categorization, measurement, data collection, and analysis techniques, must be available to allow for review and analysis by the scientific community and provide a clear and relevant overview to research users [9].

In the same vein [12] states that the method followed in health, scientific research is the valuable tool for achieving the objectives of a study,

The literature indicates two major research paradigms: qualitative (naturalistic) and quantitative (positivist). They present a different philosophical perspective on knowledge, research design, and the type of data collected.

On the other hand, many researchers fall between these two positions and combine qualitative and quantitative strategies, designing a mixed method. In addition, there are various types of literature reviews, which researchers use either to answer research questions or to conceptualize their research framework.

As stated in [5], methods include data collection techniques (e.g., interview, observation, experiment) and data analysis techniques (e.g., qualitative-quantitative).

As a result, several deficiencies can affect method design [13]. Weak research conduct and analysis, lack of detailed written protocols, poor accuracy, and statistical power can produce misleading results and waste valuable resources [14]. This is extremely important, especially in clinical research, given the replication of research protocols, which is currently a problem.

Due to this lack of clarity in applying the method and the potential impact of inappropriate use of the research method, this work aims to explore the application and use of the research method in key published articles in the health field available on the Barometre website [1].

An overview of the use of research methods in the health sciences that encompass medical sciences, nursing, dentistry, veterinary, and other health profession is not available in the literature. This work has synthesized the different subsections of the research method conceptualized in [9]: population and sample, ethical considerations, type of research design, mode of data collection, the conduct of research, and data analysis.

2. Method

The secondary data was collected from the Financial Services Authority (OJK). In the context of improving academic research, analyzing one's research activities based on their results is generally considered the most practical and relevant [18].

Although various review methods have been proposed, the systematic review is ideal for systematically gathering, examining, and synthesizing a corpus of literature. Aspects (Fig 1) used in this systematic review are similar to those of [8]

We chose the Moroccan Institute of Scientific and Technical Information (IMIST) database as the data source for this study based on its status, reputation, and barometer that focuses on the specifics of national scientific research.

This study promoted transparency in the review by following a clear protocol, defined according to each review stage prior to collecting the data.

The researchers opt for a non-probability purposive sample [9] in the top articles published between 2015 and 2019 in the following fields: Medicine, Dentistry, Health profession, Nursing, Veterinary.

The data collection is specially adapted to the objective of the review. After analysis of the articles identified as eligible based on the inclusion criteria, the reports of discussions, the meetings reports, and the guidelines are excluded from this systematized review.

The search strategy and the articles obtained in the search were reviewed three times to ensure appropriate sample selection and rigorous data extraction, ensure the accuracy of the results, and always with the research objective in mind to conduct the review.

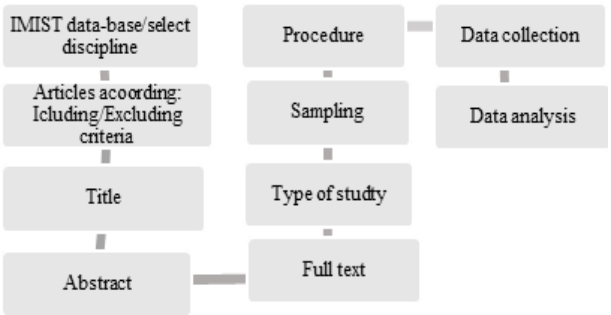

Fig. 1 Systematic review procedure

3. Results

The initial review produced 111 articles. The inclusion and exclusion criteria resulted in a final sample of 103 articles (Fig. 2).

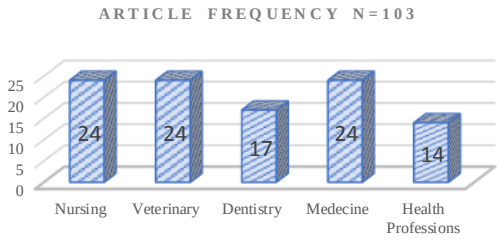

Fig. 2 Article frequency in health sciences discipline

The triangle of health research comprises three interrelated operational categories: biomedical, health services, and behavioral [19].

Biomedical research essentially comprises the basic studies of processes at the cell level. It is the broad field of science devoted to studying life processes, the prevention and treatment of disease, and the genetic and environmental factors related to disease and health. It involves investigating biological processes and causes of disease in humans and animals through experiments, observations, analyses, laboratory work, and careful testing [3]. Health research deals with problems related to the human environment and their effects at the cellular level: behavioral research studies the interaction between humans and the environment to reflect the person's beliefs, attitudes, and habits in society.

We selected the research articles from the Moroccan institute of scientific and technical information (IMIST) database to represent the fields of health sciences as it provides a clear and concise classification of the vast amount of data.

As research methods are not specific to a particular field, we subdivided the articles into methodologies: sampling, design, data collection, and data analysis. We categorized the articles based on information reported in the articles and not inferred by the researchers.

Firstly, regarding the research methods used, our results show that researchers are more likely to use quantitative research with 68.93% compared to all other research methods.

The literature review with its variants was the second most common research method, accounting for only about 20.38% of the overall method.

Mixed research was almost 6.79% as qualitative studies, which accounted for only 2.91%, and only 0.97 who did not write down their research method (Table 1, Fig. 3).

Table 1 Research method in the top articles of health sciences

Research method	**Nursing**	**Veterinary**	**Dentistry**	**Medicine**	**Health professions**
Quantitative	18	18	16	9	10
Review	2	4	0	14	1
Mixed method	2	2	0	1	2
Qualitative	2	0	1	0	0
Not stated	0	0	0	0	1

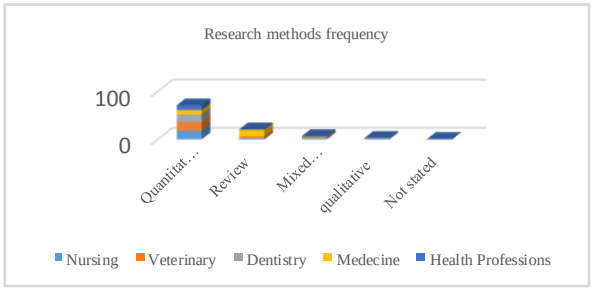

Fig. 3 Research method frequency

In the present study, 66% of the collected articles did not specify a sampling method.

The remaining articles that did specify their sampling methods represent 34%. According to [9], these sampling methods included probability or non-probability sampling.

The simple random sampling method was the most likely to be applied (20.38%), followed by an exhaustive sampling with (4.85%), purposive sampling (3.88%), which is similar to convenience sampling (3.88%), and lastly, stratified sampling with (0.97%) (Table 2, Fig 4).

According to [3], there are three research tracks: basic, primary, and secondary research.

Basic research includes animal experiments, cellular studies, biochemical, genetic, and physiological research, and studies on the properties of drugs and materials. Clinical and epidemiological research focuses on understanding, treatment, prevention, and the causes, distribution, and historical changes in disease incidence, respectively. While secondary research summarized the available studies in the form of reviews and meta-analyses.

Table 2 Sampling method used in top health sciences articles

Sampling method	**Medicine**	**Dentistry**	**Health Professions**	**Veterinary**	**Nursing**
Not stated	21	7	8	17	15
Single sampling random	2	4	4	3	8
Exhaustive sampling	0	3	0	2	0
Purposive sampling	0	2	2	0	0
Convenience sampling	0	1	0	2	1
Random sampling Laminate	1	0	0	0	0

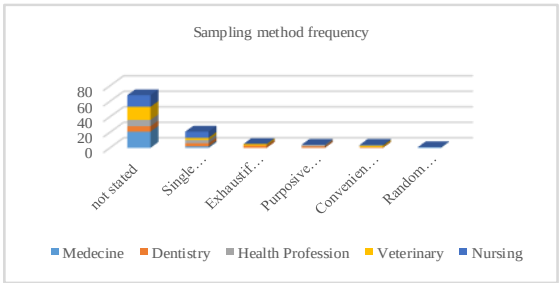

Fig. 4 Sampling method frequency

In the present review, we considered that clinical

and epidemiological research is the most popular in the health sciences; it accounted for (61.18%). However, basic research accounted for (17.47%), while secondary research accounted for (20.38%).

On the other hand, the most used research designs in the top health science articles were systematic review and experimental clinical research with a rate of (10.67%). It was followed by a diagnostic, cross-sectional, and cohort study, which accounted for a rate of 7.76% equally, then a simple literature review was present with a rate of 5.82%. At the same time, secondary analysis and descriptive design accounted for 4.85%. Case-control and retrospective studies accounted for 4%, and we listed the rest of the designs in the table with values varying between 1 and 3% of the total designs explored (Table 3, Fig 5).

According to [9] data collection refers to the measurement tool(s) used (scale, questionnaire, observation, experiment).

The present study shows that the most used data collection tool is the clinical examination, followed by the biological examination, documents, and data are in third place, followed by the experimental task.

Table 3 Research design used in top health sciences articles

Research design	Medicine	Dentistry	Health professions	Nursing	Veterinary	Total
Systematic review	10	0	1	0	0	11
Clinical Experimental study	0	1	0	1	9	11
Diagnosis study	1	5	0	2	0	8
Cross-sectional study	1	1	1	4	1	8
Cohort study	1	3	2	2	0	8
Literature review	1	0	0	1	4	6
Secondary analysis	4	0	1	0	0	5
Descriptive design	1	0	1	3	0	5
Biochemistry	0	0	2	1	1	4
Retrospective study	0	2	1	1	0	4
Case-control study	0	1	0	3	0	4
Narrative review	2	0	0	1	0	3
Animal study	0	0	1	2	0	3
Therapy study	1	1	0	0	1	3
Method development	0	0	1	1	0	2
Imaging procedure	0	0	2	0	0	2
Genetic study	0	0	0	0	2	2
Cell study	0	0	0	1	1	2
Case report	0	1	0	1	0	2
Case series	0	0	0	0	2	2
Material development	0	1	0	1	0	2
Not stated	0	0	1	0	0	1
Simulation	1	0	0	0	0	1
Case study	0	0	0	1	0	1
Gene sequencing	0	1	0	0	0	1
Ecological study	0	0	0	0	1	1
Comprehensive review	1	0	0	0	0	1

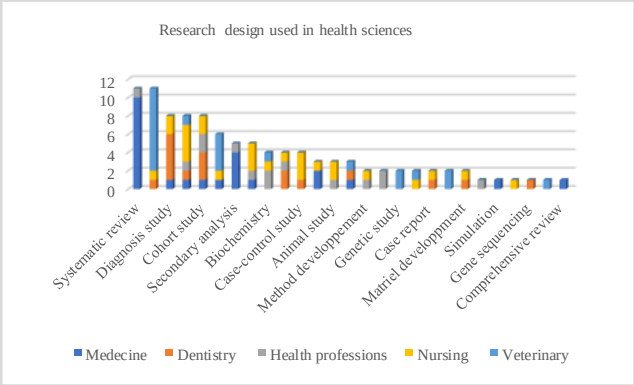

Fig. 5 Research design frequency

For the different types of reviews, the data extraction form is in first place with (12%); the questionnaire, the tests, and the interview are present with a value that varies between 5% and 8% (Table 4, Fig. 6).

Table 4 Data collection use in top health sciences article

Data collection	Medicine	Dentistry	Nursing	Health professions	Veterinary
Clinical examination	3	9	8	2	7
Biological examination	1	1	5	0	14
Documents/Data	7	2	7	1	2
Experimentation	0	2	0	6	9
A data extraction form	8	0	2	0	2
Questionnaire	5	3	1	2	1
Radiological examination	1	8	1	0	0
Test	0	2	3	0	2
Interview	1	0	2	2	0
Synthesis method	1	0	1	2	1
Observation	0	0	2	0	2
Biomaterial	0	1	0	0	2
Intervention	0	1	0	0	1
Model	0	1	0	1	0
Facial technology analysis	1	0	0	0	0

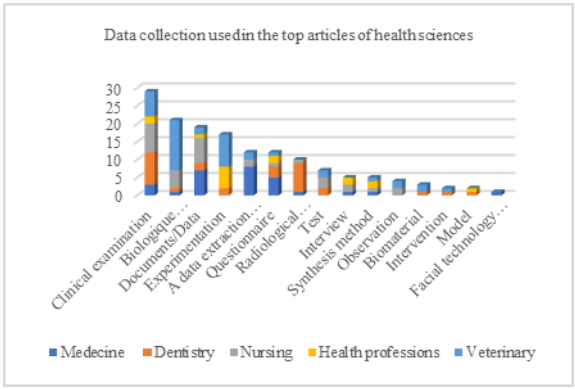

Fig. 6 Data collection frequency

In addition to describing the sample, the type of design, and the mode of data collection, the method section also includes statistical tests [9].

The present study reveals that descriptive statistics are present in 33% of the total articles, followed by Pearson correlation in (13.59%), which is almost similar to the rate of the ANOVA variance test. The

student test is present in 7.76% of the articles, and qualitative descriptions are present with 7.76% of the total studies. However statistical tests not indicated are often in favor of different literature reviews. They represent 5.80%; this rate is similar to that of the KHI2 test; the other statistical tests are present in the table below (Table 5).

Table 5 Data analysis used in top health sciences articles

Data Analysis	**Veterinary**	**Nursing**	**Medicine**	**Health Professions**	**Dentistry**	**Total**
Descriptive statistics	6	10	8	2	8	34
Pearson's Correlation	3	2	2	4	1	14
The Anova Variance	6	4	0	2	1	13
t-student tests	3	3	1	0	1	8
qualitatives descriptions	0	3	0	2	3	8
Odds Reports	1	3	1	2	0	7
not indicated	2	0	3	1	0	6
Khi2 Test	0	2	0	0	4	6
Test Wilcoxon rank-sum	1	2	1	1	0	5
The Bayesian Statistics	1	0	4	0	0	5
Dunnet t-test	3	1	0	1	0	5
Bonferroni Test	0	3	0	0	1	4
Kappa's coefficient	1	0	0	0	3	4
ANCOVA	0	3	0	0	0	3
Tukey’s test	3	0	0	0	0	3
Kolmogorov-Smirnov Test	0	3	0	0	0	3
Logistic Regression	1	1	1	0	0	3
Multivariate Cox Models	0	0	0	0	3	3
Simulation	0	0	2	1	0	3
Mann Whitney test	0	2	0	1	0	3
Regression Lineaire	0	2	0	0	0	2
calculation of similarity measure	0	0	0	2	0	2
Kaplan-Meier Analysis	0	0	1	0	1	2
Brunch and Cut Algorithm	0	1	0	1	0	2
Kruskal-Wallis Test	0	2	0	0	0	2
Multiple regression	0	0	2	0	0	2
The Rho Correlation of Spearman	0	2	0	0	0	2
ISO Quality Model	0	0	0	1	0	1
Bending test	0	0	0	0	1	1
Diagram Q-Q	0	1	0	0	0	1
Factorial Analysis	1	0	0	0	0	1
Monte Carlo simulation	0	1	0	0	0	1
Narrative Synthesis Analysis	0	0	1	0	0	1
Shapiro Wilk test	0	1	0	0	0	1
The Propension Score	0	0	1	0	0	1
The Univariate Cox Models	0	0	0	0	1	1
Z-test	0	1	0	0	0	1

4. Discussion

This systematic review categorized the leading articles published between 2016 and 2019 in the health sciences, including medicine, dentistry, nursing, health professions, and veterinary medicine, to provide a clear overview of the use of research methods.

This research indicated what methods are used, how they are used, and for which discipline.

First, primary research is dominant as opposed to secondary research. However, according to the stipulations of the health sciences, real studies are conducted in primary research since they involve conducting and collecting raw data.

This study also reveals that quantitative research is still prevalent in the various fields of health sciences. Although, qualitative methods can also be used to complement and understand quantitative findings [7].

However, qualitative and mixed-methods research is almost uncommon, and it remains underused. This finding corroborates with [2], who states that young health researchers tend to pursue the same positivist ideals, while qualitative and mixed methods research examples are rare. This contradicts [22], which argues that qualitative research is becoming highly exploited in health science recently.

Although Qualitative research has particular characteristics based on specific underlying objectives and paradigms [21], the information produced is more subjective. Their questions can be evaluated using standardized instruments [6].

Consequently, the low frequency of qualitative and mixed studies may be related to the fusion of qualitative and quantitative data and is mainly due to the various methodological errors that can be submerged [25]. However, as stated in [17], mixed research is a methodological innovation increasingly used to address contemporary health services issues. Despite the low frequency of mixed design in the present study, they clearly defined their methodologies.

This work also reveals that the systematic review remains the first choice for medical science studies. This corroborates with [15], who realized that the rate of reviews was important and exceeded that of qualitative studies. However, reviews also require more indicators to show their transparency and rigor. This approach is not clear in most of the journals in this study. To do this, researchers need to pay more attention to the methodologies of different types of journals.

In addition, the majority of the methods sub-sections of the articles reviewed are clearly indicated and were presented to allow researchers to understand the general use of the methods and not just the frequently used methods. Thus, the authors relied on the written information; they did not infer by themselves to explore the different sections of the method.

This study indicates that experimental clinical research is proving to be very dominant, occupying nearly one-third of these articles, underscoring the trend toward clinical trials because they are considered

the only way to obtain reliable estimates of the real impact of an intervention [16]. The current body of research is growing rapidly, with more than 1 million clinical research articles published from randomized trials alone.

The participating publications described the phases of their trials transparently, as clinical research does not achieve utility through its results but the detailed description of its process and method design [14].

Regarding the target population and/or sample section, the simple random type is much more used than other sampling types in the majority of articles. However, a significant proportion of articles do not specify their sampling technique used. However, a good research article generally contains a description of the sampling method, as well as the determination of the sample size and inclusion/exclusion criteria, and the characteristics that allow one to determine whether the sample is representative and to establish a rationale on a statistical basis for the application of the results [9]. For, inappropriate sampling can weaken the legitimacy of interpretations [20].

In addition, the procedure of the research or intervention and data collection is an integral part of the research method, and it is a crucial step where the researcher is expected to explain in detail the process of his work on the manuscript, and he must ensure that it is clear and involve the reader [23].

The majority of the articles highlight the use of standardized instrumental measures, whether clinical, biological, or radiological; in other words, they use instruments imported that ensure their validity and reliability, and those created for the study have proven their validity and reliability. Because the quality of the data has long been paramount, and everything starts with the data, the majority of the current studies have been excluded from publication because they are based on falsified data.

Furthermore, statistical knowledge is a very important skill by which the researcher chooses the test that answers the research question. Statistics allow us to understand a topic much more deeply and predict the outcome [9].

However, the use of inappropriate statistical models for research questions, incorrect treatment of aberrant or missing data, lack of control, and poor presentation of results compromises the quality of the information conveyed [4], [11]. In the present study, the majority of the studies related their hypotheses or questions to the statistical tests used, and thus their presentations remained descriptive statistics followed by differential statistics.

In general, the present research reveals that almost all articles follow the design of the various sub-sections of the research method according to their methodological standards. There is a reason for their presence among the best articles. Although, the type of research is considered an indispensable section of the research method. In addition, the description of the study procedure gives more validity to the results, clarifies the methodological process for novice researchers, and can promote replication of the research.

In fact, this work classified the data according to the information presented in the article rather than interpreted the methodology that should be applied, or if the methods indicated, respected the criteria of the methods used.

This study is the result of many efforts to promote the understanding and design of the research method, and therefore help novice researchers give more attention to research methods and produce useful work to advance in their careers and produce results that can contribute concretely to development.

The gaps in good research practices are partly responsible for weaknesses in the quality and subsequent relevance of research [10].

The implications of this study can extend to both theory and practice as the first constitutes a field of knowledge organization, and the second is conceived as a field of evidence-based application and to informed decision making among health professionals.

This study has no limitations. Firstly, the choice of the top articles to achieve the research objectives does not ensure representativeness on the use of the methods in health and subsequently limited generalizability. Secondly, the present study has opted to review the articles published during three years. A large enough sample may give different results. In other words, researchers in this field need to multiply their reviews regarding the design and application of the research method. Thus, this exploration can lead to the promotion of research in all health disciplines. Since the methods section is not discipline-specific, research users in other disciplines can become aware of it.

5. Conclusion

This study has highlighted the use of the research method for top elected articles in the health sciences, including medicine, nursing, health professions, dentistry, and veterinary medicine.

This study provides an overview of the use of the research method in the health sciences, specifically for each field discipline.

All method sections are clearly indicated and have been tabulated to allow researchers to understand the general use of methods and not just the frequently used methods.

One gap that needs to be addressed is in the sampling section. It needs to be expanded, and it needs to be well designed.

The present study also reveals that while quantitative research is still widespread in the health sciences, qualitative research has remained underutilized. Data collection and analysis techniques are clearly stated in most articles studied. However,

they need to take importance even in literature reviews. In conclusion, the challenge for researchers is to produce new knowledge or solve existing problems, but the challenge lies in the design of its research method.

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