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Letter to Editor

Types of Percentages in Different Studies and Their Applications in Medical Research

Dear Editor

Percentages play a crucial role in medical research by providing a clear and concise way to present data and analyze findings. Understanding the different types of percentages used in various studies is essential for accurately interpreting research results and making informed decisions in the field of healthcare.[1] In this paper, we explore the diverse applications of percentages in medical research and discuss how they are used to convey important information to clinicians, researchers, and policymakers.

Types of Percentages

In the context of two-dimensional frequency tables (cross-tabulations), three common types of percentages are used.[2]

Row Percentage: In this approach, each row's total is considered 100%. It shows how responses are distributed within each row category.

Row percentage=(cell frequency/row total)×100

Column Percentage: Here, each column's total percentage is considered 100%. This figure illustrates the distribution of responses within each column category.

Column percentage=(cell frequency/column total)×100

Total Percentage: In this case, the total number of observations in the entire table is considered 100%, and each cell is shown as a percentage of that total.

Total percentage=(cell frequency/total number of cells)×100

Choosing the True Percentage Type for Different Studies

The choice of percentage type depends on the study design and the research question.

Cross-Sectional Studies

In cross-sectional studies, data are collected at a particular point in time from a representative sample of the population. When reporting findings from such studies, total percentages are generally recommended as the exposure and outcome variables are recorded simultaneously.[3] As an exception, if the primary aim is to estimate the prevalence of a particular condition, behavior, or characteristic within subgroups of a demographic variable, reporting row percentages is generally the most appropriate approach. This method helps illustrate how a dependent variable (e.g., presence of a disease) is distributed across categories of an independent variable (e.g., age groups, sex). For example, to determine the prevalence of diabetes across age groups, age groups are placed as row headers, and row percentages are used to show the proportion of each age group that has diabetes.[2]

Example 1: A cross-sectional study was conducted to investigate the association between smoking status and lung cancer incidence. Two questions were asked of each individual: 1. Do you currently smoke? 2. Do you currently have lung cancer? Considering the cross-sectional nature of the study and the fact that the exposure (smoking) and outcome (diagnosis of lung cancer) were measured simultaneously, reporting the total percentage is the most appropriate choice (table 1).

Retrospective (Case–Control) Studies

Retrospective studies look back in time to analyze associations between exposures and outcomes. Researchers might calculate the percentage of participants who experienced a specific event or outcome in the past based on collected data.[4] This method could involve calculating proportions or percentages of cases within specific subgroups. In these studies, column percentages are commonly used, particularly when comparing characteristics between groups (e.g., cases vs. controls).

Table 1: Association between smoking status and lung cancer in a cross-sectional study

Variable		Lung cancer	
		No	Yes
Smoking status	No	120 (60%)	20 (10%)
	Yes	50 (25%)	10 (5%)

Table 2: Association between smoking status and lung cancer in a retrospective study

Variable		Lung cancer	
		No	Yes
Smoking status	No	120 (70.6%)	20 (66.7%)
	Yes	50 (29.4%)	10 (33.3%)

Table 3: Association between smoking status and lung cancer in a prospective study

Variable		Lung cancer	
		No	Yes
Smoking status	No	120 (85.7%)	20 (14.3%)
	Yes	50 (83.3%)	10 (16.7%)

Example 2: To investigate the association between smoking status and lung cancer in a case–control study, a sample of 30 patients and a sample of 170 healthy individuals were included in the study. All participants were asked about their smoking status over the past 20 years. Given that two distinct outcome groups (patients or healthy controls) were included in the study and that the study design moved from outcome to exposure, reporting percentages within each outcome subgroup (column percentage) is the correct approach (table 2).

Prospective (Cohort) Studies

In prospective studies, researchers follow participants over time to assess exposures and outcomes. The percentage types in prospective studies may include cumulative incidence rates, which represent the percentage of individuals who develop a particular outcome during the study period. Researchers may also calculate the risks or probabilities of events occurring within specific time frames. In these studies, row percentages are often used to compare characteristics between exposed and nonexposed groups.[5]

Example 3: To investigate the association between smoking status and lung cancer in a prospective study, a group of 60 smokers and a group of 140 nonsmokers were enrolled and followed up for 20 years to determine the incidence of lung cancer in each group at the end of the study. Given that two distinct exposure groups (smokers and nonsmokers) were included and that the study direction was from exposure to the outcome, reporting percentages within each exposure subgroup (row percentage) was the correct choice (table 3).

Interventional Studies (Experimental, Quasi-experimental, and Randomized Clinical Trials)

In this type of study, researchers may report percentages to compare the prevalence of outcomes in intervention and control groups. Percentage types can help demonstrate the effectiveness of interventions. Therefore, row percentages are often used to compare characteristics between intervention and control groups.[6]

Overall, the choice of percentage type in medical research depends on the study design, research questions, and objectives. Selecting the correct type of percentage is essential for accurate data interpretation and for avoiding misleading conclusions. Researchers must carefully consider the appropriate calculation and interpretation of percentages to communicate findings and implications accurately across different types of studies.

Authors' Contribution

H.RSh: Study concept, drafting and reviewing the manuscript; E.S: Study concept, data gathering, and

drafting; all authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Declaration of AI

The authors declare that no AI tools were used in the preparation of this manuscript.

Conflict of Interest

Hadi Raeisi Shahraki, serving as an Editorial Board Member of the Journal, played no role in the handling of this manuscript at any stage. To ensure impartiality, the Editorial Board convened a team of independent experts to review the manuscript without his involvement or awareness.

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