KJA
Korean Journal of Anesthesiology

The principles of presenting statistical results: Table

Sang Gyu Kwak[1], Hyun Kang[2], Jong Hae Kim[3], Tae Kyun Kim[4], EunJin Ahn[2], Dong Kyu Lee[5], Sangseok Lee[6], Jae Hong Park[7], Francis Sahngun Nahm[8], Junyong In[9]

[1]Department of Medical Statistics, Daegu Catholic University School of Medicine, Daegu, Department of Anesthesiology and Pain Medicine, [2]Chung-Ang University College of Medicine, Seoul, [3]Daegu Catholic University School of Medicine, Daegu, [4]Yangsan Hospital, Pusan National University School of Medicine, Busan, [5]Guro Hospital, Korea University School of Medicine, Seoul, [6]Sanggye Paik Hospital, Inje University College of Medicine, Seoul, [7]Haeundae Paik Hospital, Inje University College of Medicine, Busan, [8]Seoul National University Bundang Hospital, Seongnam, [9]Dongguk University Ilsan Hospital, Goyang, Korea

Statistical Round

Korean J Anesthesiol 2021;74(2):115-119
https://doi.org/10.4097/kja.20582
pISSN 2005-6419 • eISSN 2005-7563

Received: October 25, 2020
Revised: December 20, 2020 (1st); January 6, 2021 (2nd); February 9, 2021 (3rd)
Accepted: February 9, 2021

Corresponding author:
Junyong In, M.D., Ph.D.
Department of Anesthesiology and Pain Medicine, Dongguk University Ilsan Hospital, 27 Dongguk-ro, Ilsandong-gu, Goyang 10326, Korea
Tel: +82-31-961-7875
Fax: +82-31-961-7864
Email: dragona1@dumc.or.kr
ORCID: https://orcid.org/0000-0001-7403-4287

General medical journals such as the *Korean Journal of Anesthesiology* (*KJA*) receive numerous manuscripts every year. However, reviewers have noticed that the tables presented in various manuscripts have great diversity in their appearance, resulting in difficulties in the review and publication process. It might be due to the lack of clear written instructions regarding reporting of statistical results for authors. Therefore, the present article aims to briefly outline reporting methods for several table types, which are commonly used to present statistical results. We hope this article will serve as a guideline for reviewers as well as for authors, who wish to submit a manuscript to the KJA.

Keywords: Comparative study; Guideline; Publication formats; Research report; Statistics; Tables.

Introduction

It has been encouraging to see the growing number of outstanding article submissions and publications in the *Korean Journal of Anesthesiology* (*KJA*) over the years. Unfortunately, however, the diversity of result presentation format, alongside the number of manuscripts, has resulted in confusion not only in the review and publication process but also in delivering appropriate information to the readers. Presenting results derived using similar statistical methods in a prescribed tabular format recommended by the journal will not only simplify the review and publication process but also help with readers' understanding of the published content.

General methods of presenting easy-to-read results can be found in the previous article [1]. In this article, we present specific examples of the appropriate application of the Instruction for Authors of KJA[1)] to the tabular results for various analysis methods commonly used in research.

Common statistical tests and tables

Various types of tables are used to clearly present various forms of research results. Even if presented independently, tables must contain the essential elements needed to

convey the necessary information. For instance, the title must contain sufficient description of the content, while the body and footnotes of the table must describe in detail the statistical method and results of the analysis.

The following are the examples of typical tabular results commonly submitted to this journal. The data used in the examples were generated randomly, unless otherwise indicated, and do not reflect results of a specific study, i.e., the presented results have no clinical significance.

Common guidelines

Statistic provided in all the tables follow the guidelines on the representation of significant figures and statistics in the Instructions for authors provided by the KJA. There must be no blank spaces in the table and estimate, sample size (n), and the statistical method used must be appropriately included when presenting results using statistical analysis. Quantitative data can be expressed as a representative value and its distribution, such as 'mean ± standard deviation' or 'median (first quartile, third quartile). Qualitative data can be expressed as 'frequency (percent, %)', et al. For statistical analyses involving variable transformation that changes the shape of the distribution (i.e., log transformation), statistic reflective of the original value should be used. An inverse statistic may also be expressed if needed. Description of the transformation method and transformed values must accompany variable transformation. For more information on data transformation, refer to Lee's article [2].

Based on the statistic derived from the sample data of the study, the population parameters are estimated. It is recommended to display a confidence interval (i.e., 95% CI) that is an interval estimator along with point estimators such as mean, median, proportion, coefficient, et al. The previously derived estimates are described together with the hypothesis test results. P value must be described in three decimal places, and a test statistic should be presented in detail so that statistical inference can be made. Presenting the effect size, if possible, can aid the interpretation of statistical results.

An explanation of the abbreviations must be included in the footnote even if an explanation is provided in the text so that the table can be interpreted independently. The unit of measure of each variable must be accurately described, and the number of samples should be presented in the title or alongside the variable.

One sample comparison

In one sample comparisons, the data of the experimental sample are compared to a specific reference value. The example in Table 1 is a comparison between the arterial pressures of the experimental sample with the reference value of 60 mmHg. Based on the distribution of experimental data, a parametric or non-parametric method of statistical analysis was applied, along with the difference between the reference value and that of the experimental sample and its 95% CI.

In the case of categorical data, proportions, etc. can be compared. One sample proportion test can be performed to compare the response rate with the reference value, and when the response rate is close to 0% or 100%, an exact binomial test is sometimes performed. The comparison results are described in Table 2 along with the 95% CI of the response rate.

Comparison of two independent samples

Table 3 presents the results of comparing the mean arterial pressure and heart rate after endotracheal intubation when two types of endotracheal intubation devices were used. A parametric or non-parametric method of statistical analysis is applied depending on the distribution of the experimental data. The statistical method used is described in the table along with a representative value suitable for the distribution. To facilitate the interpretation of the results, the difference between the two groups is presented and the corresponding P value is presented to three decimal places.

Table 1. Example of One Sample Comparison with Reference Value

Variables	Results	Reference value	Difference (95% CI)	P value
MBP (mmHg, n = 30)*	70.0 ± 5.0	60	10.0 (8.0, 12.0)	< 0.001†
MBP (mmHg, n = 28)‡	70 (64.0, 75.0)	60	10.0 (8.0, 12.0)	< 0.001†

Values are presented as mean ± SD or median (Q1, Q3). MBP: mean blood pressure. *One-sample t-test, †Two-sided P value < 0.05, ‡Wilcoxon's signed rank test. These values, including P values, are presented according to the Instructions for Authors of Korean Journal of Anesthesiology for notation below the decimal point.

[1] https://ekja.org/authors/authors.php

https://doi.org/10.4097/kja.20582

Table 2. Example of One Sample Test of Proportions

Variables	Positive response	Reference probability	Response rate (95% CI)	P value
PONV (n = 25)*	9	0.20	0.36 (0.18, 0.57)	0.080
Itching sense (n = 64)†	5	0.02	0.08 (0.03, 0.17)	0.009‡

PONV: postoperative nausea and vomiting, *One sample proportion test with continuity correction, †Exact binomial test, ‡Two-sided P value < 0.05. These values, including P values, are presented according to the Instructions for Authors of Korean Journal of Anesthesiology for notation below the decimal point.

Table 3. Example of Independent Two Sample Comparison

Variables	Group S (n = 49)	Group P (n = 53)	Difference (95% CI)	P value
MBP (mmHg)*	72.3 ± 14.3	73.1 ± 14.9	−0.8 (−6.5, 4.9)	0.781
Heart rate†	89.0 (75.0, 103.0)	82.0 (72.0, 93.0)	7.0 (0, 14.0)	0.062

Values are presented as mean ± SD or median (Q1, Q3). MBP: mean blood pressure. *Independent two sample t-test, †Mann-Whitney U test. These values, including P values, are presented according to the Instructions for Authors of Korean Journal of Anesthesiology for notation below the decimal point.

Table 4. Example of Dependent Two Samples Comparison

Underlying factors	MBP		Mean difference (95% CI)	P value
	Pre-treatment	Post-treatment		
Hypertension (n = 20)*	74.0 ± 13.9	70.9 ± 13.6	3.1 (0.4, 5.8)	0.026†
BMI > 30 kg/m^2 (n = 25)‡	75.4 (66.8, 81.5)	73.9 (65.0, 84.5)	1.5 (-1.0, 4.0)	0.228

Values are presented as mean ± SD or median (Q1, Q3). BMI: body mass index, MBP: mean blood pressure. *Paired t-test, †Two-sided P value < 0.05, ‡Wilcoxon's signed rank test. These values, including P values, are presented according to the Instructions for Authors of Korean Journal of Anesthesiology for notation below the decimal point.

Table 5. Example of Three Independent Samples Comparison

Variables	Control group (n = 30)	ITM group (n = 30)	QLB group (n = 30)	P value
Morphine requirement (mg)*	61.0 ± 12.9	42.8 ± 10.4	18.2 ± 9.6	< 0.001†
Time to first morphine dose (h)‡	2 (0.5, 4)	8 (3, 24)	17 (6, 36)	0.002†

Values are presented as mean ± SD or median (Q1, Q3). ITM: intrathecal morphine, QLB: quadratus lumborum block. P values indicate the statistical inference result of overall comparisons. *One-way analysis of variance with Tukey's method, †Two-sided P value < 0.05, ‡Kruskal-Wallis H test with Dunn's procedure. These values, including P values, are presented according to the Instructions for Authors of Korean Journal of Anesthesiology for notation below the decimal point. Excerpt from Salama ER [3] results showing representative values and P value as examples of comparison of three independent samples.

Comparison of matched pairs

Table 4 presents data from a study measuring mean blood pressure before and after the administration of a drug. The table presents results of administering the drug in a sample of hypertensive patients and a sample of patients with a body mass index over 30 kg/m^2. The number of patients in each sample has been presented and the mean or median blood pressure was used as the representative value according to the distribution of measurements. A paired t-test was used to perform a paired comparison using the difference in pre- and post-treatment values for each patient. The statistically estimated differences are presented alongside the its 95% CI. The statistical method and P value is also clearly presented.

Comparison of three or more independent samples

Results from a study on pain control following a Cesarean section are presented in Table 5 [3]. The administered dose of morphine and time taken until the first dose was compared between a control group that received normal saline, a group that received intrathecal morphine and a group that received a quadratus lumborum block. Morphine requirement with a normal distribution was expressed as 'mean ± standard deviation', while the time taken until the first dose was expressed as a 'median (Q1, Q3)' value as it did not satisfy the normal distribution assumption. An accurate P value, up to 3 decimal places, and the number of samples in each group are presented, while a detailed description of the statistical method including the multiple comparison method for

Table 6. Example of Categorical Data Comparison

Variables	Group N (n = 49)	Group C (n = 53)	P value
Successful tracheal intubation*	44 (89.8)	32 (60.4)	0.001†
Sore throat at 1 h‡	11 (22.4)	20 (37.8)	0.144
Vocal cord paralysis‡	1 (2.0)	2 (3.8)	> 0.999

Values are presented as frequency (%). *Chi-squared test, †Two-sided P value < 0.05, ‡Fisher's exact test. These values, including P values, are presented according to the Instructions for Authors of Korean Journal of Anesthesiology for notation below the decimal point.

post hoc analysis is provided.

Categorical data comparison

Table 6 presents results of an investigation analyzing the occurrence of successful endotracheal intubation, sore throat 1 hour following tracheal extubation, and post-surgical vocal cord paralysis in two groups treated with an existing versus newly developed endotracheal tube. Results were reported as the frequency of occurrence and relative frequency and the statistical method and P value are clearly presented.

Logistic regression analysis

The dependent variable is a nominal scale. This analysis method is widely used when selecting a meaningful variable among various explanatory variables and results are presented in terms of odds ratio, etc. Parts of results of a study published in the KJA is presented in Table 7 [4]. The study analyzed the risk factors of post-anesthesia emergence agitation in the recovery room. Variables with three or more components were converted into insignificant dummy variables to estimate the odds ratio. The table presents the odds ratio of referenced components and those converted into dummy variables alongside the 95% CI. A detailed description of the statistical methods used to select variables in the logistic regression analysis is also included.

Conclusion

This article examined the principles of presenting the statistical results in clinical studies as a table. We hope to see manuscript submissions with standardized tables reflective of the provided framework. Such standardized format will help facilitate the submission and review process for both authors and reviewers.

Table 7. Risk Factors of Emergence Agitation in the PACU (n = 158) [4]

Variables	Odds ratio (95% CI)	P value*
Marital status		
Divorced	Reference	
Single	0.16 (0.04, 0.64)	0.009†
Married	0.16 (0.04, 0.62)	0.008†
Pre-existing ND	6.78 (1.36, 33.80)	0.020†
Gynecological surgery	0.29 (0.12, 0.71)	0.007†
Thoracic surgery	0.23 (0.07, 0.80)	0.021†
IO bleeding	1.00 (1.00, 1.00)	0.047†
IO morphine administration	1.15 (1.03, 1.28)	0.015†
Analgesic drugs in PACU	2.99 (1.56, 5.73)	0.001†

The odds ratio of Marital status is estimated with non-weighted dummified variables. IO: intraoperative, ND: neurologic disorders, PACU: post-anesthesia care unit, *Backward binary stepwise logistic regression, †Two-sided P value < 0.05. These values, including P values, are presented according to the Instructions for Authors of Korean Journal of Anesthesiology for notation below the decimal point.

ORCID

Sang Gyu Kwak, https://orcid.org/0000-0003-0398-5514
Hyun Kang, https://orcid.org/0000-0003-2844-5880
Jong Hae Kim, https://orcid.org/0000-0003-1222-0054
Tae Kyun Kim, https://orcid.org/0000-0002-4790-896X
EunJin Ahn, https://orcid.org/0000-0001-6321-5285
Dong Kyu Lee, https://orcid.org/0000-0002-4068-2363
Sangseok Lee, https://orcid.org/0000-0001-7023-3668
Jae Hong Park, https://orcid.org/0000-0003-0779-4483
Francis Sahngun Nahm, https://orcid.org/0000-0002-5900-7851
Junyong In, https://orcid.org/0000-0001-7403-4287

Conflicts of Interest

All authors are Statistical Round Board Members in KJA.

Author Contributions

Sang Gyu Kwak (Conceptualization; Supervision; Writing – original draft; Writing – review & editing)
Hyun Kang (Validation; Writing – review & editing)
Jong Hae Kim (Validation; Writing – review & editing)
Tae Kyun Kim (Validation; Writing – review & editing)
EunJin Ahn (Validation; Writing – review & editing)
Dong Kyu Lee (Validation; Writing – original draft; Writing – review & editing)
Sangseok Lee (Project administration; Validation; Writing – review & editing)

https://doi.org/10.4097/kja.20582

Jae Hong Park (Validation; Writing – review & editing)
Francis Sahngun Nahm (Validation; Writing – review & editing)
Junyong In (Conceptualization; Supervision; Writing – original draft; Writing – review & editing)

References

1. In J, Lee S. Statistical data presentation. Korean J Anesthesiol 2017; 70: 267-76.
2. Lee DK. Data transformation: a focus on the interpretation. Korean J Anesthesiol 2020; 73: 503-8.
3. Salama ER. Ultrasound-guided bilateral quadratus lumborum block vs. intrathecal morphine for postoperative analgesia after cesarean section: a randomized controlled trial. Korean J Anesthesiol 2020; 73: 121-8.
4. Makarem J, Larijani AH, Eslami B, Jafarzadeh A, Karvandian K, Mireskandari SM. Risk factors of inadequate emergence following general anesthesia with an emphasis on patients with substance dependence history. Korean J Anesthesiol 2020; 73: 302-10.