# CONSORT Abstract Item Reporting Quality and Altmetrics in the Cardiovascular Core Clinical Journals

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## ABSTRACT

The purpose of this study was to assess the CONSORT abstract item reporting quality in the cardiovascular articles published in the core clinical journals and its relation with altmetrics score. The study has conducted on the abstracts of 492 articles on cardiovascular diseases published in the core clinical journals in Medline in 2015. The abstracts of these articles were scored based on the CONSORT checklist. The altmetrics score and its sources were extracted using Altmetric Bookmarklet. Descriptive statistics and Spearman's correlation coefficient were used to analyze the data. No article had considered all the items of the CONSORT checklist. Of all 17 points in the CONSORT checklist, the articles' highest score was 15, with a mean of 7.57. The criteria related to the participants (98.6%), interventions (95.5%), purposes and outcomes (96.1%), and conclusion (96.3%) were reported appropriately. The highest score of altmetric was 1164, with a mean of 59.61 and a median of 10. There was a direct and meaningful relationship between the CONSORT and altmetrics score ($\rho$ =0.514, $P$<0.001). The abstracts with higher reporting quality received higher altmetrics score; thus, they were likely to receive more attention from researchers and the public on the web and social networks. Conducting training courses for researchers and reviewers of articles and asking journal editors to follow the checklist items will increase the reporting quality of abstracts and maybe the altmetrics scores.

**Keywords:** Randomized clinical trials, Cardiovascular articles, Altmetrics, CONSORT, Quality of Reports.

## INTRODUCTION AND PROBLEM STATEMENT

Randomized controlled clinical trials (RCTs) are among the essential types of studies for answering medical questions, whose results are significant in making medical and therapeutic decisions.[1,2] This can be considered as one of the integral parts of evidence-based medicine and the base of systematic review studies.[2-4] Thus, these studies need designing, implementation, accurate, precise, and high-quality analysis, and accurate and clear reports so that their results can be utilized in planning, policy-making, and basic decision-making in healthcare and treatment.[1,5,6] Otherwise, their results can be incomplete, biased or exaggerated, making decisions in the medical field erroneous. Thus, the high quality of clinical trial reports is of particular importance. It should be noted that although implementing different studies and reporting them are different stages of a research, they are connected to each other. The accurate report of these studies can show their exact implementation.[7]

A comprehensive guide for evaluating the quality of their reports called Consolidated Standard of Reporting Trials (CONSORT) can be used to provide accurate and high-quality reports in RCTs. This statement is one of the most widely used biomedical research reporting guidelines.[1] Many authoritative journals use this statement to evaluate the clinical trial articles.[6] This statement was first published in 1996. It has 25 components, one of which is related to the evaluation of the abstracts.[2] The CONSORT was reviewed in 2010. Using the CONSORT can improve clinical trial reporting and, in fact, enhance the quality of research used in health care decision-making (http://www.consort-statement.org/).

One of the ways to tackle a large number of articles is to read their abstracts.[8] Many physicians, in their medical decisions, suffice to read abstracts.[9] As the abstract of the article is the first, and in many cases the only part of a report read, it is of utmost importance.[5,10] Thus, without an explicit report of the results, there would be the chance of misleading the reader.[11] Furthermore, the abstracts of the articles have a significant

role in identifying relevant articles and deciding whether to read or not to read the full text of articles by making available the content and the overall results of the article wholly and compactly.[9] Given the importance of abstracts, especially in clinical trials, in January 2008, the CONSORT expanded the abstract component and provided a separate checklist for evaluating the abstracts with eight components and 17 items.

On the other hand, altmetrics is a new criterion for evaluating the scholarly impact. In altmetrics, the evaluation of articles is based on the extent of their use and sharing by audiences in social networks, and it is used as an indicator to evaluate the impact of articles on social media.[12] Besides citation-based evaluation methods, altmetrics considers other aspects of the impact of a document, such as the number of reading or downloads of the article, being mentioned in social media and news media,[12,13] and the use of altmetrics is increasing day by day as potential indicators of societal impact.

The cardiovascular domain is one of the essential medical areas, and its related diseases are the commonest cause of mortality and morbidity in the world. The mortality rates due to cardiovascular diseases have risen from 26% to 32% from 1990 to 2013 in the world.[14] This has led to a huge cost imposed on health systems.[15] Moreover, it has caused many clinical trials to be conducted in this domain annually and made available to all experts, researchers, and the clinical staff through scientific publications.

Previous studies indicated that clinical trial reports had been evaluated in different areas, but not so much in the cardiovascular field.[1,5,8,16-21] Furthermore, some studies have investigated the relation of citations and altmetrics.[12,22-25] Grundy *et al.* studied the relationship between disclosed conflict of interests in biomedical research and its relation with altmetrics. They concluded that articles with positive conflict of interest disclosures received higher altmetrics scores.[26] Stevanovic *et al.* studied the CONSORT reporting quality of critical care articles and its relationships with citations and Impact Factor. They obtained a direct correlation between the CONSORT adherence and the article citations and journals' Impact factor.[27] Araujo *et al.* studied the factors related to the altmetrics score of low back pain RCTs published in the Physiotherapy Evidence Database (PEDro, www.pedro.org.au). They did not obtain a correlation between altmetrics and methodological quality of the trials (measured by the 0-10 item PEDro scale). They also indicated that there is a correlation between altmetrics score and citations.[28] However, the relationship between the reporting quality of articles' abstracts and social media presence is not clear. Therefore, this study aims to assess the association between the quality of RCT abstracts in cardiovascular core clinical journals with their altmetrics scores.

## METHODOLOGY

The method of this study is an evolutional survey in the section of assessing the quality of RCTs' abstracts with CONSORT and a correlational study in the section of investigating the association between altmetrics and CONSORT scores. The population included abstracts of articles that focused on cardiovascular diseases with a randomized controlled clinical trial design in core clinical journals indexed at the Medline in 2015. Core clinical journals limits search to 119 journals considered to be of immediate interest to practicing physicians and could be retrieved in the section of journal categories filter of Medline.

In the first stage, all articles on cardiovascular diseases were retrieved in the Medline database using the Medical subject heading (MeSH). Then, through the filtering part of the website, the randomized controlled clinical ones of Core Clinical Journal type, being indexed in 2015, were retrieved. Those English language studies were selected, which were about human specimens. The studies about the animals were excluded from the research. According to the retrievals in June 2017, the number of included records was 687 articles. The search formula was as follows:

The "Cardiovascular Diseases" [Mesh] AND (Randomized Controlled Trial [ptyp] AND has abstract [text] AND ("2015/01/01 [PDAT]:" 2015/12/31 "[PDAT]) AND" humans "[MeSH Terms] AND English [lang] AND jsubsetaim [text])

In the second step, the data from the abstract of these articles were extracted based on the CONSORT abstract checklist (http://www.consort-statement.org/extensions/overview/abstracts), and their different sections were examined and scored by two researchers. In cases of incompatibility, they consulted with two other people (one methodologist and one epidemiologist). At this stage, 195 articles were excluded from the study. These articles were included:

- Articles that were not RCTs or resulting from RCTs (such as systematic reviews, Cohort, registries).

- Articles included only the study and methodology of its implementation without conclusion part due to not being completed.

- Articles resulting from pilot studies and the ones not related to cardiovascular disease.

Thus, the CONSORT checklist in the study evaluated 492 articles' abstracts.

The scoring process of the abstracts was in a way that if each item of the checklist`s options were observed in the article, score one would be given, and if no option of the checklist item was observed, no score was given. Finally, all these scores were added together, and a total number (0–16) was obtained

from the CONSORT checklist for each abstract. The percent of conformity of abstracts with items and components was determined in the abstracts. It should be noted that the item of the author, which was specific to the abstracts of articles presented at the congresses, was removed from the checklist of the current study.

In the third stage, the altmetrics score was extracted using the altmetrics bookmarklet provided by the Altmetric Institute at the https://www.altmetric.com/. The total altmetrics score and its indicators scores, Mendeley and CiteULike readers were extracted.

In the fourth stage, the collected data in the study were analyzed after being entered into SPSS, version 15, using descriptive statistics such as mean, median, and standard deviation. Then, one sample Kolmogorov Smirnov test was used to examine the statistical distribution of numerical variables with normal distribution. As the distribution of variables was not normal, the Spearman correlation coefficient was used to examine the association between the compliance with the CONSORT components and altmetrics scores.

## RESULTS

### CONSORT components and items

Out of the 492 articles abstracts examined, none of the abstracts obtained the total score [16], and four articles received a score of 15. The lowest score was four (2.8%), the highest score was 15 (1%), and the mean score was 7.57 with a median of seven and a standard deviation of 2.10.

In addition, the average percentage of the compliance with the CONSORT components was 47.28% with a standard deviation of 13.12%, and the median percentage of the compliance with CONSORT components was 43.75% (IQR 37.5% –56.25%).

As Table 1 shows, the highest level of compliance with the CONSORT items was related to "Participants," "Conclusion," "objective," "Interventions," and "Primary outcomes" having over 95% compliance; most of them are the items of "methods" component. The lowest score was attributed to "randomization" (7.7%) and "blinding" (8.9%) from the "methods" component, "number analyzed," and "Recruitment" (12.4%) from the "results" component.

### Altmetrics scores

Table 2 indicates that among the 492 articles examined, 448 articles (91.06%) had altmetrics scores. The lowest altmetrics score was zero, and the highest was 1591. Furthermore, the median of the altmetrics score of articles was 10, which was located between the second and third quarters (from 2 to 46.75). The mean of altmetrics was 60.81, with a standard deviation of 141.38. The highest score of altmetrics indices

**Table 1: Compliance rate of cardiovascular articles with the CONSORT components.**

| CONSORT Components and Items | | Numbers of compliance (%) | Numbers of not-compliance (%) | The whole number articles |
|---|---|---|---|---|
| Title | | 219 (44.5%) | 273 (55.5%) | 492(100%) |
| Trial design | | 88(17.9%) | 404(82.1%) | 492(100%) |
| Methods | Participations | 485(98.6%) | 7(1.4%) | 492(100%) |
| | Interventions | 470(95.5%) | 22(4.5%) | 492(100%) |
| | Objective | 473(96.1%) | 19(3.9%) | 492(100%) |
| | Primary outcome | 473(96.1%) | 19(3.9%) | 492(100%) |
| | Randomization | 38(7.7%) | 454(92.3%) | 492(100%) |
| | Blinding (Masking) | 44(8.9%) | 448(91.1%) | 492(100%) |
| Results | Numbers randomized | 136(27.6%) | 356(72.4%) | 492(100%) |
| | Recruitment | 61(12.4%) | 431(87.6%) | 492(100%) |
| | Numbers analyzed | 61(12.4%) | 431(87.6%) | 492(100%) |
| | Outcomes | 216(43.9%) | 276(56.1%) | 492(100%) |
| | Harms | 73(14.8%) | 419(85.5%) | 492(100%) |
| Conclusion | | 474(96.3%) | 18(3.7%) | 492(100%) |
| Trial registration | | 299(60.8%) | 193(39.2%) | 492(100%) |
| Funding | | 109(22.2%) | 383(77.8%) | 492(100%) |
| All | | 3719(47.28%) | 4153(52.72%) | 492(100%) |

**Table 2: The altmetrics scores of cardiovascular articles.**

| Altmetric score / Altmetric indicators | Frequency (%) | Highest score | Median | Mean | Standard deviation |
|---|---|---|---|---|---|
| Twitter | 439(89.23) | 863 | 8(2-28) | 41.04 | 105.62 |
| News outlets | 201(31.91) | 104 | 0(0-2) | 2.94 | 8.25 |
| Bogs | 157(53.86) | 30 | 0(0-1) | 1.18 | 2.85 |
| Facebook | 265(15.04) | 126 | 1(0-1) | 4.77 | 13.05 |
| Research highlights | 74(13.01) | 9 | 0(1-4) | 0.17 | 0.54 |
| Policy documents | 64(16.06) | 3 | 0 | 0.15 | 0.42 |
| Google + | 79(4.27) | 11 | 0 | 0.42 | 1.43 |
| Reddit | 21(3.25) | 4 | 0 | 0.06 | 0.35 |
| Wikipedia | 16(2.64) | 2 | 0 | 0.04 | 0.22 |
| YouTube | 13(2.00) | 2 | 0 | 0.03 | 0.21 |
| Q & A | 1(2.03) | 1 | 0 | 0 | 0.04 |
| Peer-review | 10(1.83) | 1 | 0 | 0.02 | 0.14 |
| Sina Weibo | 9(1.83) | 10 | 0 | 0.04 | 0.47 |
| Mendeley | 446(90.65) | 855 | 23.5(8-51) | 50.66 | 94.10 |
| CiteUlike | 53(10.77) | 7 | 0(0-2) | 0.19 | 0.70 |
| Altmetrics | 448(91.06) | 1591 | 10(2-46.75) | 60.81 | 141.38 |

was associated with Twitter with a score of 8863, and the lowest score was related to Q & A having the score of one. 90.65% of the articles had a Mendeley readers score, and 10.77% had a CiteULike score, where the highest Mendeley score was 855, and the highest score of CiteULike was seven.

## Correlation between altmetrics scores and compliance with the CONSORT components

Table 3 indicated a significant correlation between the rate of compliance with CONSORT criteria and the altmetrics score ($r$ = 0.514 and $P$-value<0.001). In addition, there was a significant correlation between the compliance rate of CONSORT criteria and all altmetric indicators scores ($P$-value<0.001) except Wiki, Q & A, and YouTube ($P$-value>0.001). This correlation was also observed between the compliance rate of the CONSORT and Mendeley and CiteULike readers ($P$-value <0.001).

## DISCUSSION

A detailed review of clinical trial abstracts is essential. Eliminating important and valuable information can mislead readers when making clinical decisions.[8] If an article abstract has obtained 16 grades of CONSORT criteria, it shows that the most complete and accurate needed information is mentioned in the abstract. However, in this study, no article had obtained a complete score, and the highest score was 15 that four articles had obtained. The mean of the scores obtained was

**Table 3: Correlation between altmetrics scores and compliance rate of the CONSORT.**

| | CONSORT score | |
|---|---|---|
| | Correlation Coefficient | *P*-Value |
| Twitter | 0.495** | <0.001 |
| News outlets | 0.412** | <0.001 |
| Blogs | 0.476** | <0.001 |
| Facebook | 0.388** | <0.001 |
| Research highlights | 0.202** | <0.001 |
| Policy documents | 0.225** | <0.001 |
| Google + | 0.235** | <0.001 |
| Reddit | 0.157** | <0.001 |
| Wikipedia | 0.073 | 0.103 |
| YouTube | 0.058 | 0.200 |
| Q & A | 0.060 | 0.186 |
| Peer-review | 0.143** | 0.002 |
| Sina Weibo | 0.103** | 0.004 |
| Mendeley | 0.400** | <0.001 |
| CiteUlike | 0.216** | <0.001 |
| Altmetrics | 0.514** | <0.001 |

**. Correlation is significant at the 0.01 level (2-tailed).

7.75, with a standard deviation of 2.10. The results of this study were mostly consistent with a study by Guo and Iribarren, which reported a mean of 7.77 for compliance with CONSORT criteria in nursing article abstracts. In the mentioned study, one article has pointed to all items in the checklist.[29] In the study by Ghimire *et al.*, the mean score of articles in high-impact oncology journals was 8.2 before using the CONSORT checklist, and it was 9.9 after using the checklist.[18] It has gained a better score in both studied periods than the present research findings. Maybe the reason for this difference is that Ghimire *et al.* have reviewed the articles published in journals with high impact.[18] However, in some studies, this score was lower than the results of this study.[30,31]

The median score of the abstract of cardiovascular articles was seven (43.75%). This showed a lower value than the abstract of the published articles in pharmacy with the median of 9.[8] However, compared to the abstracts of congresses in oncology with a median of 5.5,[32] and Chinese medical journals with a median of 3[33] showed higher scores. As Blair *et al.* stated, the limitation in abstract length constraints, the lack of authors' awareness of CONSORT criteria, and the lack of attention of authors and journals to the CONSORT can be cited as the reasons for non-compliance of abstracts with CONSORT guidance.[8]

The participations, objectives, interventions, primary outcome, and conclusions had been reported as good (above 95%). However, randomization, blinding, recruitment, numbers analyzed, harms, trial design, funding, and numbers randomized in each group with a level below 30%, were not reported as proper.

Stating the method by which the participants were randomly assigned to the control group or the intervention should be stated in the "randomization" item, which had the least compliance rate (7.7%) in the present study. The compliance of this item in most studies conducted in different domains was more than this value.[17,18,29] In more studies, this item scored less than the present study (less than 2%).[5,30,32-35]

Besides, compliance rate of the blindness in the examined articles was very low (8.9%). In most studies, the reason for this was that only the type of blinding had been mentioned, whereas according to the CONSORT statement, it should be mentioned explicitly that blindness is done on which group: participants, health care recipients, or evaluators of the results. In some previous studies, stating the words "single-blind" and "double-blind" have led to the calculation of the score for this part of the CONSORT checklist,[5,33] whereas this reporting method was not acceptable in terms of the CONSORT.

The results also showed that the lowest altmetrics score was zero (44 articles), and the highest score was 1591.

Furthermore, the median of altmetrics scores was ten, and the mean was 60.81. In a study, the published articles on the "Heart" journal, the highest score of altmetrics was reported as 617.[13] However, the scope of the present study, which had been conducted on a large number of cardiovascular articles, as well as the fact that the different time data collection of this study was done only on the articles of one journal, can be among the reasons for the higher altmetrics scores of the present study.

Like those of Eysenbach,[36] the results of the present study, indicated that the Tweeter had the highest score among the sub-scores of altmetrics. Twitter is one of the social networks whose use is easy for researchers and the public; thus, the articles can easily be tweeted. The highest number of abstract tweets in this study was 863 having the median of eight and the mean of 41.04. In addition, about 90% of the studied articles had shared and read in the Mendeley. According to the results of the present and earlier studies,[37,38] among the examined social media, the articles read and stored on Mendeley and mentioned on Twitter, Facebook, and weblogs more than other altmetric indicators. Thus, they can be used as a comprehensive instrument for researchers.

The results revealed a direct and significant relationship between the compliance rate of the CONSORT components in the abstracts and altmetric and its indicators scores. No studies have been conducted regarding the relationship between the CONSORT and altmetrics scores. However, Araujo *et al.* indicated no correlation between the PEDro scale and altmetrics scores of low back pain RCTs.[28] Other studies had reported a positive correlation between citations and the quality of reporting systematic review abstracts,[39] as well as citations and altmetrics,[12,22–24,28] number of Mendeley readers and citations,[40] and number of published articles on Twitter and received citations.[36]

## CONCLUSION

Given the positive correlation between the reporting quality of abstracts and the altmetrics score, it can be concluded that the abstracts with higher reporting quality received higher altmetrics scores and, thus, are likely to receive more attention from researchers and the public on the web and the social networks. This may affect our understanding of the reporting quality of abstracts and their impact.

It should be noted that over 50% of the core medical journals on PubMed have adopted CONSORT (http://www.consort-statement.org/about-consort/endorser1), and the editors of the other core medical journals should set these guidelines for the authors to report their RCTs based on the CONSORT. The reviewers and editors should also comply with the CONSORT. As Stevanovic *et al.* have noted, "Even if the

journals have limitations in the maximum of used words in the article, the CONSORT items should be addressed at least in supplemental data".[27] In addition, training workshops suggested being held for students, researchers, and reviewers of articles on how to report accurately and in proportion to the types of the studies, and the importance of the CONSORT checklist.

## CONFLICT OF INTEREST

The authors declare no Conflict of interest.

## FUNDING

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