A Critical Analysis of Publications in The IJO Over 2006-15

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Purpose: To qualitatively evaluate original articles in the IJO published over the decade from 2006 to 2015, using specific critical appraisal checklists (CACL), to assess whether publications have improved over time.

Methods: All articles were classified either as systematic reviews/meta-analysis; randomised control trials; before and after studies; cohort studies; observational or descriptive and diagnostic test studies; and Economic analysis scored using CACLs. Scores were converted to percentages and compared between the earlier five years (E5Ys) and the later five (L5Ys). Annual trend in article counts and CACL scores were assessed. T-test and ANOVA, with significance set at p ≤ 0.05 was used. 95% CIs are quoted.

Abstract

Results: Of a total of 529 original articles, there were 159 in the E5Ys, in 28 issues, while in the L5Ys; there were 370 articles in 48 issues. The mean score for E5Ys was 81.9±9.8% compared to 80.9±12.4% for L5Ys: p=0.26. Maximum articles (134) were in 2014. No significant trends in number and scores were observed.

Conclusions: There were no significant qualitative differences in the quality of articles during the decade 2006 to 2015. Vitreoretinal subspecialty and observational studies formed the main bulk of articles published in the IJO during this decade. Systematic reviews and meta-analysis, considered the highest level of evidence, have scored the least on CACL.

Material and Methods

We designed this study to qualitatively evaluate original articles in the IJO published over the decade from 2006 to 2015 using specific CACLs.

Keywords: Critical Appraisal, Checklists, Evidence Based Medicine, Indian Journal Of Ophthalmology, Quality Of Research.

Introduction

The explosion of research has resulted in over 15 million articles in 5000 journals monthly as of 2000.1 How good are these articles? How much importance should we assign to the evidence? Despite editorial boards and referees, poor quality articles slip through. Studies may vary from case reports to the meta-analysis.2-5 Critical appraisal, the cornerstone of evidence based medicine involves: Asking questions about research methodology; data analyses; how a particular sample size was arrived at; providing a list of the inclusion and exclusion criteria; analytical methods employed for interpretation of results. The recently accessible critical appraisal checklists (CACLs) allow us to qualitatively comment on the worth of an article.6,7,8 We designed this study to qualitatively evaluate original articles in the IJO published over the decade from 2006 to 2015 using specific CACLs.

Of the eight CACLs, six (for SR/MA, RCT, CS, CCS, EA, DTS) were available from Critical appraisal skills programme (CASP),4 and used with minor modifications.5,11 For example, out of 10 questions in the CASP checklist for SR/MA, two questions asking for the results and their precision were omitted as they could not be graded ordinally as we intended to. For RCT, eight out of 11 were retained from the original, two asking for results were omitted because of the similar reason given above, while one question following them through time to identify which participants develop the outcome(s) of interest or look back at data that were created prior to the development of the outcome.10 In CCS, researchers identify study participants as diseased or not diseased and allow for statistical associations between exposure and outcomes to be established. CCS consist of assessing a population at a single point in time. DTS compare a new diagnostic method with the current “gold standard” diagnostic procedure in a cross-section of both diseased and healthy participants. EA determine the optimum use of scarce resources, involving comparison of two or more alternatives in achieving a specific objective under the given constraints.

CACLs have a common theme and are scored as yes (a value of 2), can’t say (a value of 1) and no (a value of 0) in decreasing order of importance. The aspects covered are the following: Does the paper ask a clear research question? Are the aims of the study clearly stated? Is the methods section sufficiently clear to allow the research to be repeated by others? Are the results clearly presented with appropriate graphics and statistical tests? Is the sampling, recruitment method and inclusion/exclusion criteria clearly stated? Are the strengths and weaknesses of the study fully described? Is the referencing adequate, with inclusion of relevant previous work? Is there a statement of ethics committee approval?

Keywords: Critical Appraisal, Checklists, Evidence Based Medicine, Indian Journal Of Ophthalmology, Quality Of Research.
originally asking whether subjects were masked was altered to: whether masking was double, single or not carried out, deserving scores of 2, 1 and 0. Six questions, as such or after some modification, were added from Scottish Intercollegiate Guidelines Network (SIGN)\textsuperscript{5,12} checklist for RCT, covering the following issues: Was sample size explained? Were treatments the only difference between groups? Drop-out rate in the treatment arm: $\leq$10% Yes, 10-20% Can’t Say, $>$20% No. If concealment was adequate? How well was biased minimized? With responses being: High quality (Yes), Acceptable (Can’t say), Low (No). Were ethical issues explained?

For BFR/AFT, we used the CL available from the National Institute of Health Quality Assessment Tool,\textsuperscript{13} for DS/CXS, we adopted the one from the Journal of American Medical Association (JAMA) series.\textsuperscript{14} Maximum scores in specific checklists were: SR/MA (16); RCT (30); BFR/AFR (24); CS (28); CCS (20); DS/CXS (22); EA (22); and DTS (18). Question asking whether “all important and relevant studies were included” proved challenging: Using the keywords we would conduct a detailed search in PubMed, Scopus and Google scholar, and widen our search by looking up ‘similar articles’ option, there could still be some uncertainty; consensus would aid us in coming to our best decision.

Each article was perused and classified by two researchers working together, on the basis of study-design and the subspecialty it covered. Some unclassifiable articles were placed in a miscellaneous group. Each article was then read by the two researchers and scored. All the questions had an ordinal response of three grades (yes, cannot say, no; scored as 2, 1 and 0). This permitted aggregating to a total score and converting to percentages. Data was uploaded to SPSS. Mean scores of earlier five years (E5Ys) (2006-2010) were compared with the later five years (L5Ys) articles (2011-2015). Moreover, they were sub-analyzed according to study-design and subspecialty. Annual mean scores, over the 10 years, were assessed for trend. We used t-test and ANOVA, with significance set at $p \leq 0.05$. 95% CIs are quoted.

**Results**

During the decade 2006 to 2015, the IJO had 76 issues, 28 in the E5Ys and 48 in the L5Ys, with 2012 articles in all.

- Total number of articles in the decade 2006 to 2015 (n=2012)
  - Editorials (95)
  - Symposia (115)
  - Brief communications & case reports (578)
  - Letters to the editors (561)
  - Journal abstracts (17)
  - Community ophthalmology articles not classified under original articles (36)
  - Articles on Ophthalmic Practice (42)
  - Others (21)
  - Original and review articles (529)

Most of the articles dealt with vitreo-retina (119) followed by glaucoma (78), cataract (60), cornea and conjunctiva (52), while those on ocular trauma (10) and ophthalmic education were the least (7) (Table 1). Study design wise, the DS/CXS (307, 58%) were the commonest, while EA (3, 0.6%) comprised the least (Table 2).

Overall, no significant differences were seen in the mean-percentage scores of the E5Ys and L5Ys; subspecialty-wise, only community-ophthalmology and neuro-ophthalmology scores showed a significant drop (Table 1); while study design-wise, only SR/MA scores declined significantly (Table 2). No trend was noticed over the decade overall (Figure 1, Table 3), or subspecialty or study-wise (Figure 2,3,4).
Table 1: Total and differences in mean percentage scores of articles, compared subspecialty wise, between the Earlier and later five years in the Indian Journal of Ophthalmology during the decade 2006 to 2015.

| Subspecialty                        | Total | Earlier five years | Later five years | P Value | Difference in Mean (95%CI) |
|-------------------------------------|-------|--------------------|------------------|---------|--------------------------|
|                                     | n(%)  | Mean (SD)          | n                | Mean (SD) | n            |                        |
| Cataract                            | 60 (11.3) | 82.6 (10.5)      | 20 (81.9 (9.7)  | 40 (82.9 (11.0) | 0.70        | -1.1(-6.7 to 4.5)    |
| Glaucoma                            | 78 (14.7) | 84.0 (10.4)      | 18 (82.9 (11.6)  | 60 (84.4 (10.0) | 0.63        | -1.5 (-7.7 to 4.7)  |
| Uvea & Endophthalmitis              | 35 (6.6 ) | 76.0 (12.4)      | 14 (78.0 (12.0)  | 21 (74.7 (12.7) | 0.45        | 3.3 (-5.4 to 12.0)  |
| Vitreo-retina                       | 119 (22.5) | 82.2 (8.9)       | 30 (81.1 (8.5)  | 89 (82.5 (9.1)  | 0.43        | 1.5 (-5.1 to 2.2)   |
| Strabismus & Amblyopia              | 30 (5.7) | 81.5 (10.0)      | 14 (83.2 (11.3)  | 16 (79.9 (8.8)  | 0.39        | 3.3 (-4.4 to 10.9)  |
| Cornea & Conjunctiva                | 52 (9.8) | 82.7 (11.4)      | 20 (81.9 (9.6)  | 32 (83.3 (12.6) | 0.66        | 1.4 (-7.6 to 4.8)   |
| Optics & refraction                 | 28 (5.3) | 83.6 (10.3)      | 5 (89.3 (5.9)   | 23 (82.3 (10.7) | 0.07        | 6.93 (-0.7 to 14.5) |
| Oculoplasty                         | 45 (8.5) | 78.5 (9.9)       | 11 (76.2 (9.0)  | 34 (79.2 (10.1) | 0.37        | -3.0 (-9.7 to 3.8)  |
| Neuro-ophthalmology                 | 24 (4.5) | 82.7 (11.5)      | 7 (88.5 (6.3)   | 17 (80.3 (12.5) | 0.046       | 8.2 (0.2 to 16.2)   |
| Community Ophthalmology             | 24 (4.5) | 67.7 (20.1)      | 6 (85.6 (5.3)   | 18 (61.8 (19.7) | <0.001      | 23.8 (13.2 to 34.5) |
| Ocular trauma                       | 10 (1.9) | 87.8 (3.9)       | 1 (86.4 (CD)    | 9 (88.1 (4.2)  | 0.71        | -1.7 (-11.8 to 8.5) |
| Ophthalmic education                | 7 (1.3) | 77.9 (20.1)      | 4 (82.9 (11.9)  | 3 (71.2 (29.6)  | 0.57        | 11.7 (-33.0 to 66.5)|
| Miscellaneous                       | 17 (3.2) | 78.4 (14.7)      | 9 (82.6 (9.2)   | 8 (73.7 (18.6)  | 0.25        | 8.9 (-7.3 to 25.1)  |
| Total                               | 529 (100) | 81.2 (11.7)      | 159 (81.9 (9.8) | 370 (80.9 (12.4)| 0.26        | 1.13 (-0.9 to 3.1)  |

*P5: Number of journals in the E5Ys = 28 and L5Ys= 48. *CD: cannot be determined as only one article is present.
Most of the 50 BFR/AFR were on vitreo-retina (13); with none on community-ophthalmology, ocular trauma and ophthalmic education. Only nine articles were CS, three each on glaucoma and vitreo-retina, two on strabismus and amblyopia and one on cataract. Of 13 CCS, seven were on vitreo-retina, two on glaucoma and one each on cataract, uvea and endophthalmitis, cornea and conjunctiva and neuro-ophthalmology. DTS were maximally glaucoma related (5), while there was no such study on cataract, ocuoplasty, neuro-ophthalmology, community-ophthalmology and ophthalmic education. There were only three EA studies, one each on cataract, vitreo-retina and community-ophthalmology (Table 2).

Discussion
To the best of our knowledge this is the first review of articles published in the IJO. In our analysis of 529 original articles, covering 76 issues, 28 in the E5Ys and 48 in the L5Ys, we found that the IJO has maintained its quality over the last decade, scoring on checklists in a band around 80% (figure 1, table 3) The L5Ys has a much greater number of articles (E5Ys: L5Ys, 159:370) which likely reflects the increased journal frequency in subsequent years.

More than half (58%) the articles were DS/CXS, possibly because such study designs do not need the rigors of RCT, nor the long follow-up of CS: also, CXS being like a snapshot are quick to perform. Understandably, we found only nine CS (1.7%). Only three articles were on EA: although more such articles are warranted given the importance of financial prudence needed in a developing country like ours (Table 2).

Overall, the EA have the highest scores (90.91%) but since there were only three articles, this may be a biased conclusion (Table 2). DS/CXS scored significantly more than RCT (mean-difference 4.7%, 95%CI for difference:0.7 to 8.6), BFR/AFR (mean-difference 6.0%, 95%CI for difference:1.3 to 10.7), and SR/MA (mean-difference 19.1%, 95%CI for difference:14.6 to 23.6). SR/MA have scored the least (65.7%) (Table 2); and significantly lesser than the RCT (mean-difference 14.4%, 95%CI for difference:8.9 to 19.9), BFR/AFR (mean-difference 13.1%, 95%CI for difference:7.1 to 19.1), CS (mean-difference 17.4%, 95%CI for difference:7.9 to 26.9), DS/CXS (mean-difference 19.1%, 95%CI for difference:14.6 to 23.6), DTS (mean-difference 14.6%, 95%CI for difference:6.0 to 23.1), and EA (mean-difference 25.2%, 95%CI for difference:7.0 to 43.5).

Nearly 23% articles were on vitreo-retina; mostly descriptive (Table 1). This may be because of the increasing use of anti VEGF and the advances in the imaging modalities like enhanced depth and multimodal imaging and advances in vitrectomy.

Table 2: Total and differences in mean percentage scores of articles, compared study design-wise, between the Earlier and the Later five years in the Indian Journal of Ophthalmology during the decade 2006 to 2015.

| Type of study                                      | Total n (%) | Mean (SD) | Earlier five years n | Mean (SD) | Later five years n | Mean (SD) | P value | Difference in Mean (95% CI) |
|---------------------------------------------------|-------------|-----------|----------------------|-----------|--------------------|-----------|---------|---------------------------|
| Systemic reviews and meta-analysis                | 55 (10.4)   | 65.7 (12.9)| 12                   | 72.9 (7.7)| 43                 | 66.9 (13.5)| <0.004 | 9.2 (3.1 to 15.4)         |
| Randomized control trials                         | 75 (14.2)   | 80.1 (11.1)| 23                   | 79.4 (13.7)| 52                 | 80.4 (9.8) | 0.77    | -0.9 (-7.4 to 5.5)        |
| Before and after study                            | 50 (9.5)    | 78.8 (8.4) | 17                   | 77.5 (6.8)| 33                 | 79.4 (9.2) | 0.40    | -1.9 (-6.6 to 2.7)        |
| Cohort study                                      | 9 (1.7)     | 76.6 (12.0)| 2                    | 78.6 (15.2)| 7                  | 76.0 (12.3)| 0.86    | 2.6 (-74.7 to 79.8)       |
| Case control study                                | 13 (2.5)    | 83.1 (10.1)| 2                    | 80.0 (7.1)| 11                 | 83.6 (10.7)| 0.60    | -3.6 (-29.5 to 22.2)      |
| Descriptive and cross-sectional study             | 307 (58.0)  | 84.7 (9.2) | 94                   | 85.3 (7.6)| 213                | 84.5 (9.8) | 0.49    | 0.72 (-1.3 to 2.8)        |
| Diagnostic test study                             | 17 (3.2)    | 80.3 (14.1)| 9                    | 76.3 (12.4)| 8                  | 84.7 (15.4)| 0.24    | -8.4 (-23.1 to 6.3)       |
| Economic analysis                                 | 3 (0.6)     | 90.9 (11.7)| 0                    | -        | 3                  | 90.9 (15.7)| *CD     |                           |
| Total                                             | 529 (100)   | 81.2 (11.7)| 159                  | 81.9 (9.8)| 370                | 80.9 (12.4)| 0.26    | 1.13 (-0.9 to 3.1)        |

PS: Number of journals in the E5Ys = 28 and L5Ys = 48.*CD: Cannot be determined as no article in E5Ys in EA.
Ocular trauma is a major cause of preventable visual impairment in the world, with a cumulative incidence of 4.3% and cumulative lifetime prevalence at >40 years of 21.1%. Despite its public health importance, publications on eye injuries are few, both internationally, and in India, which is also evident in their being just 10 articles on ocular trauma in the IJO during the period under review (Table I). Ocular trauma cases constitute a sizeable number of emergencies, yet prospective studies are lacking, most publications consisting of case series and retrospective analysis. This point towards the complexity of subject and with many subspecialties involved like retina, cornea, glaucoma and many others it becomes difficult to carry out a research project smoothly.

Likewise, only seven articles covered the field of ophthalmic education (Table I), all descriptive in nature. It is likely that the possibilities for carrying out research in this field are limited and so is the number of articles.

Overall, the ocular trauma subspecialty scored the highest (87.9%) and community-ophthalmology the least (67.7%) (Table I): with the latter scoring significantly lesser than most of the subspecialties except for uvea and endophthalmitis (mean-difference 8.3%, 95% CI for difference: -1.5 to 18.1), ophthalmic education (mean-difference 10.2, 95% CI for difference: -5.7 to 26.1), and miscellaneous group (mean-difference 8.3%, 95% CI for difference: -1.5 to 18.1), and community-ophthalmology the least (67.7%).

While they report 3.3% as RCT, we had almost four times as many at 14.2%. Between the beginning and the end of the period under review, in their study of five years, the proportion of retina articles increased too have observed that the maximum articles are from the vitreoretinal subspecialty (22.5%) including both the medical and surgical retina, and strabismus comprised a meager 5.7%. Interestingly in their study, almost 40.1% of the studies comprised CS or CCS, while in ours they formed just 4.2%, a value 1/10th of theirs. In their study SR/MA comprised 2.9%, while we had 4.2%. Kumar’s paper had 28.7% non-analytical studies (which comprised of case series and case reports): we have no comparable figures, since we had excluded the case reports. In our case, DS/CXS (including case series) were highest in number (58%). While they report 3.3% as RCT, we had almost four times as many at 14.2%. Between the beginning and the end of the period under review, in their study of five years, the proportion of retina articles increased from 32.9% in 2005 to 36.7% in 2009, while in ours over the decade they increased from 18.5% in 2006 to 24.4% in 2015: both being similarly a modest increase.

Lai evaluated 1919 articles, from four leading general ophthalmological journals for the methodological quality using the Hedges Project criteria, and level of evidence classified according to the Oxford Centre for Evidence-based Medicine Levels of Evidences. Compared to us, there are important differences here too: They reported that 54.4% of articles were original, 21.9% were case reports, and 1.4% were review articles, while in our study we have 23.5% original articles, 28.7% case reports, and 2.7% SR/MA. They reported only five (0.4%) articles on the economic aspects of ophthalmology (all published in the BJO), we also have only three EA (0.6%) articles. They had 12.3% articles on DTS.

Table 3: Year-wise mean percentage scores of the articles published in the Indian Journal of Ophthalmology during the decade 2006 to 2015

| Year of journal | Number of articles (N) | Mean scores (SD) |
|-----------------|------------------------|------------------|
| 2006            | 27                     | 83.2 (9.3)       |
| 2007            | 35                     | 86.2 (8.5)       |
| 2008            | 28                     | 79.5 (12.0)      |
| 2009            | 34                     | 81.1 (8.6)       |
| 2010            | 35                     | 79.7 (9.5)       |
| 2011            | 39                     | 80.1 (10.3)      |
| 2012            | 51                     | 76.1 (16.6)      |
| 2013            | 68                     | 82.4 (10.1)      |
| 2014            | 134                    | 81.9 (11.4)      |
| 2015            | 78                     | 81.6 (12.8)      |
| Total           | 529                    | 81.2 (11.7)      |

These lower scores in community-ophthalmology in the L5Ys, are likely attributed to the special issue of IJO having 12 articles on community-ophthalmology in this period (volume 60, issue 5, September-October 2012), and as mentioned earlier not scoring well on the CACLs.

Study-design wise SR/MA had significantly lower scores in the L5Ys compared to the E5Ys, 9.3% (Table 2). Once again, the possible reason is the special IJO edition, consisting of poorly scoring SRs (on community-ophthalmology). Since there were no studies on EA in the E5Ys, difference and its significance were not computable (Table 2).

Interestingly, one fourth of the total articles published were in 2014 (134) (Figure 1). This was also evident subspecialty wise, except for those in uvea and endophthalmitis, neuro-ophthalmology, ocular trauma, community-ophthalmology, ophthalmic education and miscellaneous; and study design-wise, barring those in SR/MA and DTS. Manuscripts reviewing research publications in medical literature are few: particularly in ophthalmology. Kumar et al analyzed seven of top 20 general ophthalmic journals during 2005 to 2009. They evaluated 12426 abstracts for the trends over the five years in terms of study-design and subspecialties: something akin to us, except that our analysis was based on articles (529) of our national general ophthalmology journal and covered a decade. Most of the articles came from retina (34.6%: this figure is derived from combining medical retina, 29.1% and surgical retina 5.5%), and least often from strabismus (2.3%). In our study, we too have observed that the maximum articles are from the vitreoretinal subspecialty (22.5%) including both the medical and surgical retina, and strabismus comprised a meager 5.7%. Interestingly in their study, almost 40.1% of the studies comprised CS or CCS, while in ours they formed just 4.2%, a value 1/10th of theirs. In their study SR/MA comprised 2.9%, while we had 4.2%. Kumar’s paper had 28.7% non-analytical studies (which comprised of case series and case reports): we have no comparable figures, since we had excluded the case reports. In our case, DS/CXS (including case series) were highest in number (58%). While they report 3.3% as RCT, we had almost four times as many at 14.2%. Between the beginning and the end of the period under review, in their study of five years, the proportion of retina articles increased from 32.9% in 2005 to 36.7% in 2009, while in ours over the decade they increased from 18.5% in 2006 to 24.4% in 2015: both being similarly a modest increase.
whereas we had only 3.2%. In their study 18.1% of articles were of the highest quality, while in our study 24.6% fall under this level. If we consider higher scoring studies as qualitatively better and assume that those with scores ≥ 95% are superior then we have 56 (10.6%) articles of a high quality, more than three fourth (78.6%) of which were descriptive. It is relevant to note that the SR/MA despite being the highest level of evidence have scored the least. This is an interesting paradox. Researchers and journals need to assess the quality of even these highest-level evidence studies.

Our study has some limitations. For instance, although we have used readily available checklists, we have carried out a few modifications. We have allocated scores to the responses to be able to get a comparable number. Not all questions may carry the same weight and therefore this approach may be considered simplistic. The fact that there is a plethora of tools and checklists, implies that medical fraternity will need more time to narrow down to globally accepted checklists to assess the quality of publications across nations, specialities and study designs.

In future, journal editors, reviewers, authors and researchers should endeavor to devise a universally acceptable metric which factors in the hierarchy of evidence and a critical appraisal score to calculate a single number to assess the value of a publication. Moreover all specialities should be given equal importance and a strong reviewer network should be built so there is no delay in the decisions.

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