Editorial

Standardization of *in vitro* studies

The majority of the *in vitro* studies lack consistency. This affects the impact of the investigation and the study transition to clinical research. This can be attributed to insufficient knowledge, poor understanding, unavailable technology, and more importantly the lack of uniform guidelines for *in vitro* studies.

The research string starts with content analysis, review, survey, *in vitro*, and *in vivo* studies. The *in vitro* studies which play a greater role in transition of data are critical and important. When effectively done, it can contribute a great amount of contributory data to research advancement and clinical documentations. However, in current scenario, a majority of the *in vitro* studies are taken for a chance and have lesser impact for research advancement. This necessitates the review on standardization of *in vitro* study guidelines.[1]

The guidelines of testing standards are constantly revised. It is essential that the standardized and updated guidelines are followed. In many studies across the journal, we found International Standards Organization (ISO) - 1999 guidelines were followed. However, many of these guidelines have been revised with modifications. The latest of guidelines alike ISO 2013 or ISO 2015 or any standardized updated guideline has to be followed for the studies. These modified guidelines are better appreciated and provide more idealistic results that aid in research transformation.

It becomes an urgent need to have a prescribed standard for *in vitro* studies alike PRISMA of systematic reviews or CONSORT guidelines of clinical studies.[2] The standards should start from sampling, the number of samples (sample size calculation). The number should be in accordance to statistical calculation of previous studies. It should be 10–15% more from regular sample size to anticipate the incontinences in standards. These samples have to recheck by an observer for manufacturing, number, finishing, and shape dimensions in accordance to the specified guidelines. Video graphing of the testing protocols for all samples and the data obtained have to be documented. The external observation can reduce the intra- and inter-operatory errors. Following these guidelines will aid in obtaining better-standardized results and in advancing the research.

The certificate of testing protocol from an officially accepted body of ISO or Bureau of Indian Standards (BIS) or from respectable institutions can substantiate the researchers study design and protocol followed. These certificates attached along with the Institutional Review Board (IRB) certificate can provide more value to the researcher study. In the absence of regulatory bodies, the suitable societies can start their own testing organizations for better appreciation.

Most of the prosthodontics studies involve testing of mechanical and physical standards. It is essential to have an understanding on the working mechanism of these instruments and equipment. The commonly used universal testing machine requires smaller or special jigs for testing prosthodontic samples unlike the regular engineering study samples. The speed and rate at which these instruments work are essential to generate the acceptable and consistency of results. The lack of understanding or outsourcing this critical component of testing can lead to erroneous results. Rather than transfer of recording from the outsourced centers, it is essential that the study is done by the researcher. This will reduce the errors in the *in vitro* studies.

Sample number, size, procedures followed in making samples, measures followed for greater replication of the study, settings,and locations where the data were collected, Listing of ISO, the American Standards Association, the American Society of Test Materials or BIS guidelines followed, interventions that was followed in sampling and manufacturing of samples, method of assessment, outcome measures, changes made in determining the outcome, description on interim analysis, randomization in sampling, statistical description, method of analysis, IRB registration, Clinical relevant end points, limitations and validity are some of the checklists that aid in study standardization. These checklists when adapted can help in standardization, better appreciation, and aid in translation to advanced research. These are minimum requirement, anything beyond or addition to these standards will be more appreciated in the research environment.

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