

How to write a paper?

(Scientific Writing in Medical sciences)

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Research Output

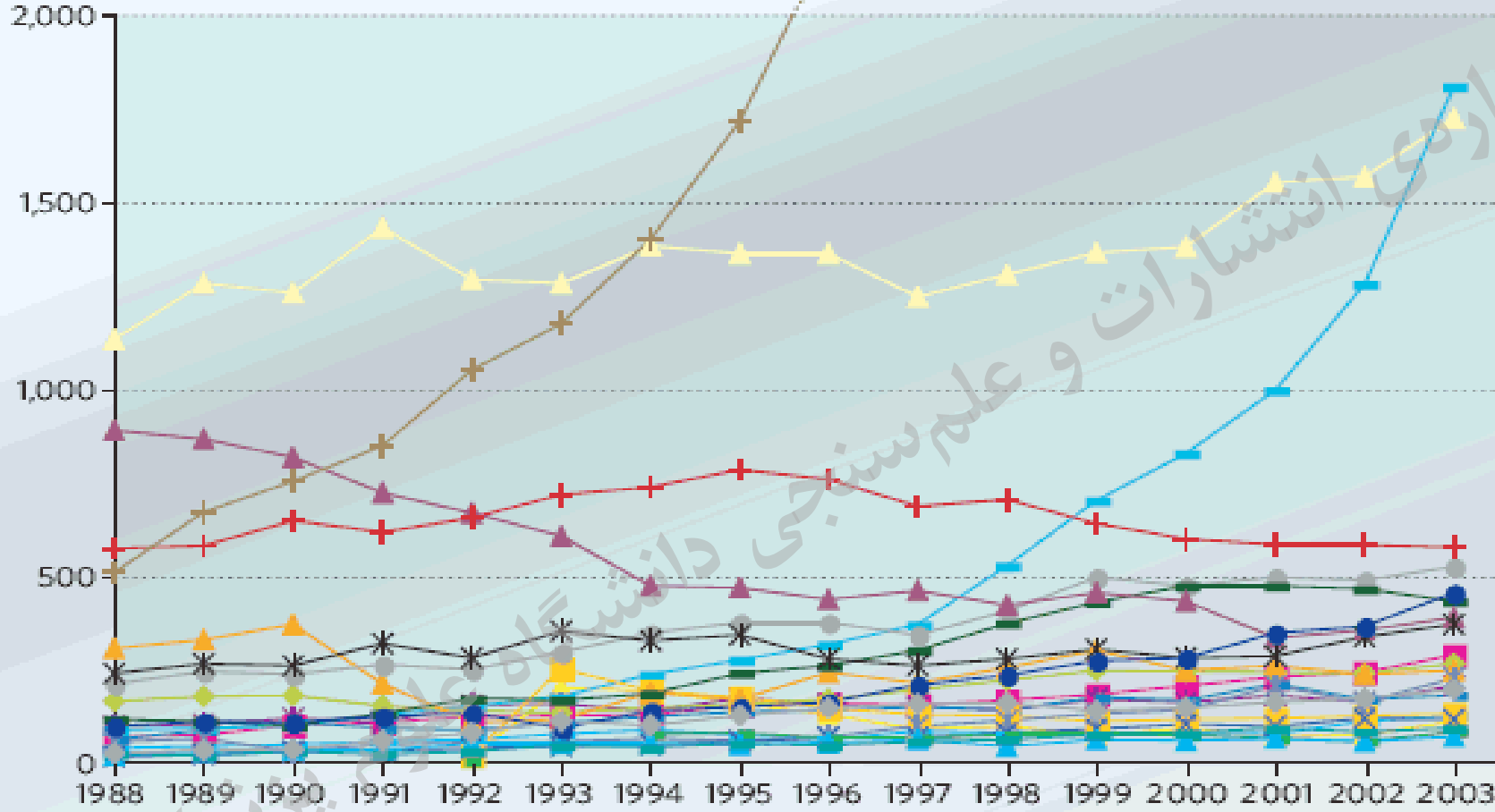
□ Three different research output are expected from research proposals:

1- Paper

2- Patent

3- Change

NUMBER OF SCIENTIFIC ARTICLES PUBLISHED PER YEAR



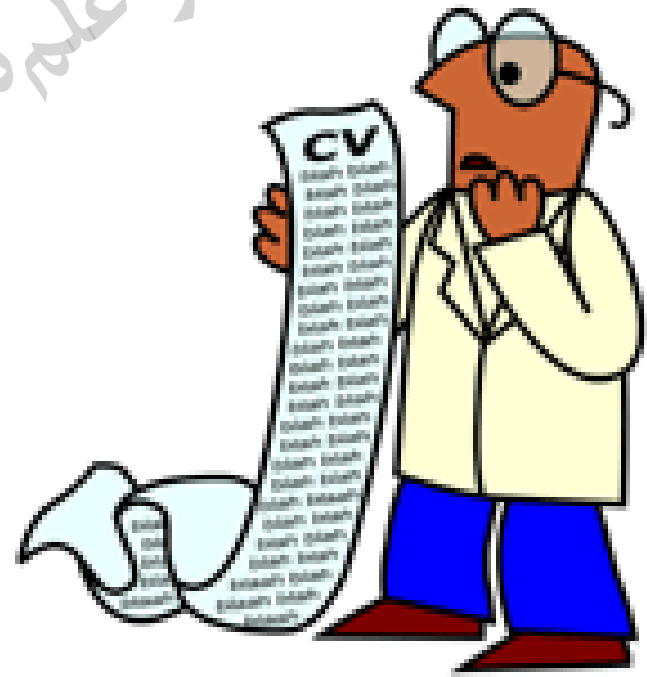
- Algeria
- Bahrain
- Bangladesh
- Cameroon
- Egypt
- Indonesia
- Iran
- Jordan
- Kuwait
- Lebanon
- Malaysia
- Morocco
- Nigeria
- Oman
- Pakistan
- Saudi Arabia
- Syria
- Tunisia
- Turkey
- Uganda
- United Arab Emirates

مقایسه فراوانی مقالات و ارجاعات صورت گرفته به مقالات منتشر شده دانشگاه علوم پزشکی تهران و دانشگاه تهران با دانشگاه‌های رتبه یک‌صدم و دویستم دنیا در مجموعه Scopus در رتبه‌بندی سال ۲۰۰۹ تایمز THS-QS

رتبه دانشگاه	نام دانشگاه	کشور	تعداد مقالات ۵ ساله در Scopus	تعداد ارجاعات به مقالات ۵ ساله اخیر Scopus	تعداد اعضای هیئت علمی	نسبت ارجاع به عضو هیئت علمی	نسبت ارجاع به مقاله
۱۰۰	دانشگاه Rice	آمریکا	۶۲۵۴	۶۶۳۴۳	۷۷۲	۹/۸۵	۶۱/۱۰
۲۰۰	دانشگاه Twente	هلند	۶۱۹۳	۳۷۴۰۳	۱۰۰۰	۴/۳۷	۰۴/۶
۲۰۱	دانشگاه اندونزی	اندونزی	۵۴۹	۲۰۹۳	۴۳۲۱	۴۸/۰	۸۱/۳
۳۶۸	دانشگاه علوم پزشکی تهران و دانشگاه تهران	ایران	۱۱۳۵۹	۳۱۰۳۰	۳۲۴۳	۶/۹	۳۷/۲

Evaluating an Academic Person through his/her CV Papers

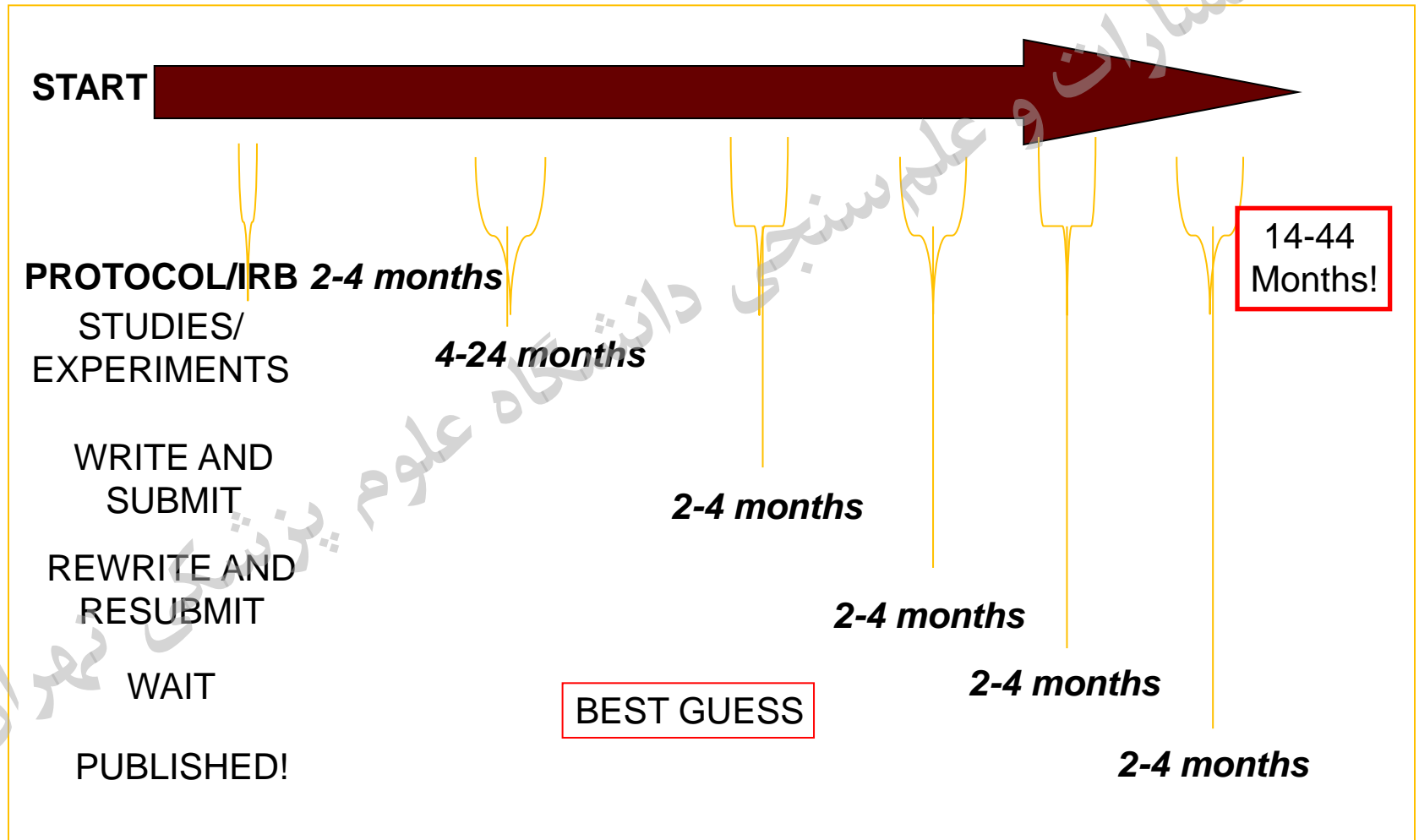
- Number of papers
- Rate of publication
- Quality of journals
- Position in list of authors
- Focus



Steps in Scientific Writing

- Design well
- Decide politics
- Choose journal
- Read instructions to authors/papers
- Set framework
- Prepare drafts
- Distribute
- Polish
- Submit

What is the gestational period for a clinical science publication?



Two Types of Studies

- Primary Study
- Secondary Study

Primary studies

- Experiments
- Clinical trials
- Surveys

Secondary studies

- Reviews (Overviews)
 - Narrative reviews
 - Systematic reviews & Meta-analyses
- Guidelines
- Decision analyses
- Economic analyses Review Article

Types of Medical articles

- Original Article
- Review Article
- Case Reports
- Editorial
- Short Communication (short papers)
- Letter to Editor
- Personal Views

Letter

- Stick to the point
- State the problem, issue or hypothesis
- Give the context
- Outline your comment, solution, viewpoint
- Give a strong conclusion
- Note limitations

Editorial

- Write for your readership
- Be controversial and thought provoking
- Being subtle is often more powerful

Short communication

- Increasingly common
- Concise introduction
- Present data and discuss it shortly
- Only a few tables or figures
- Number of words limitations

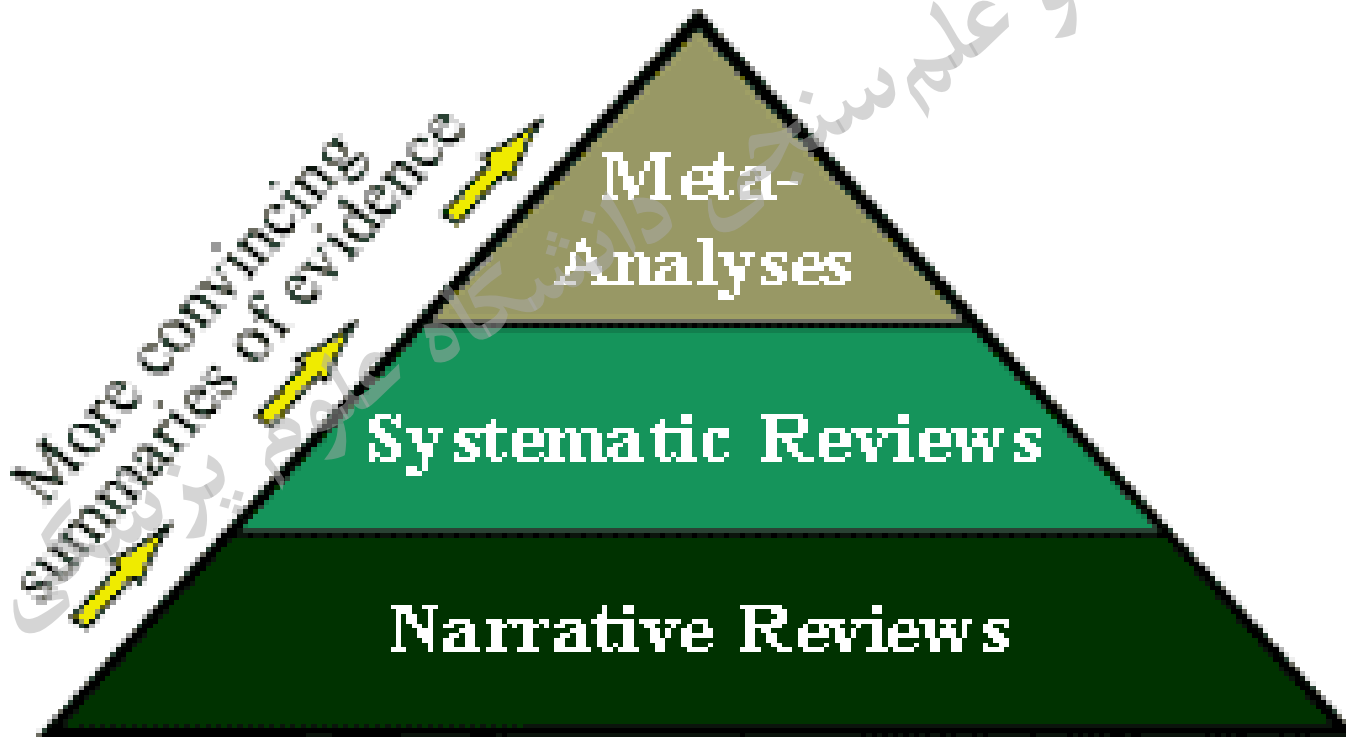
Is your paper a paper, a brief or a research letter?

- Easier to get letters & briefs accepted .
- They make you indexed easier !
- Decide whether you should submit it as a brief or letter firstly.

Case Reports

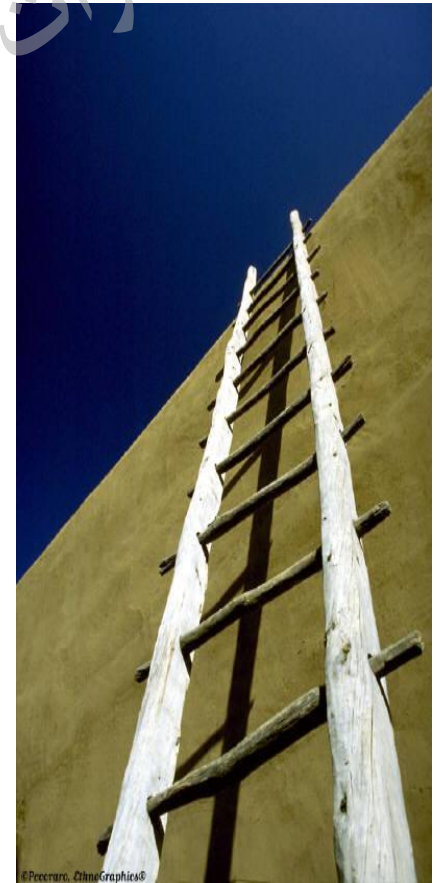
- ❑ Medical history of a single patient in a story form.
- ❑ Lots of information given which may not be seen in a trial or a survey.
- ❑ Often written and published fast compared to studies
- ❑ e.g. Thalidomide

Review Articles & Secondary Studies



The Hierarchy of Evidence

1. Systematic reviews & meta-analyses
2. Randomised controlled trials
3. Cohort studies
4. Case-control studies
5. Cross sectional surveys
6. Case reports
7. Expert opinion
8. Anecdotal



Hierarchy of studies



اداره‌ی انتشارات علوم پزشکی دانشگاه تهران
پژشکی تهران

The traditional IMRaD

- Introduction
- Methods
- Results
- Discussion

اداره‌ی انتشارات و علم‌سنجی دانشگاه علوم پزشکی تهران

The Basic Structure of an Article

TITLE

- (S)Summary (Structured Abstract)
(I) Introduction (What Question was asked?)
(M)Methods (How was it Studied?)
(R)Results (What was Found?)
(A)Analysis (How data was analysed?)
(D)Discussion (What Do the Findings Mean?)

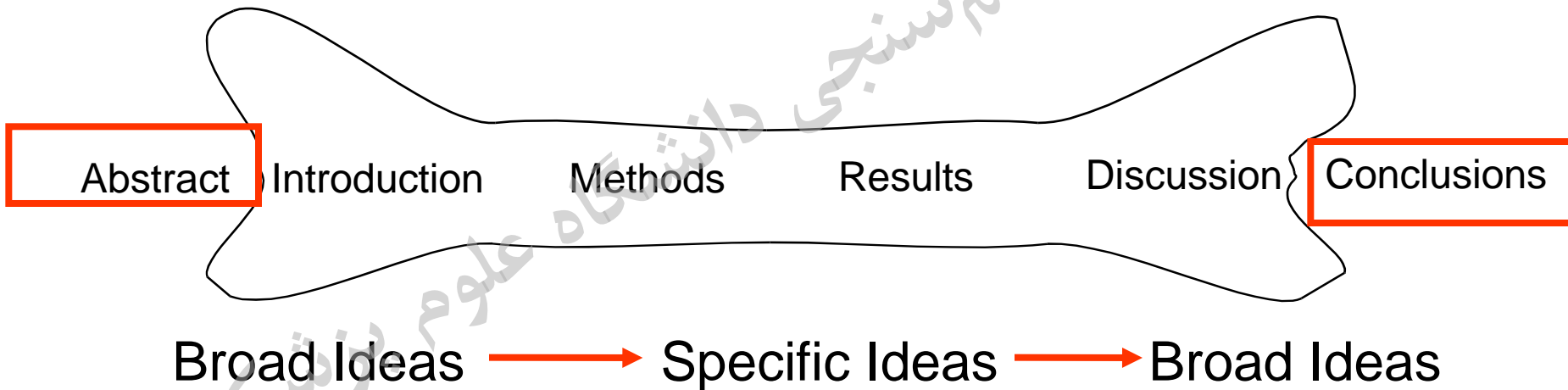
Acknowledgements

References

Main Components of an Article

- **I**ntroduction: **W**hy did you start?
- **M**ethods: **W**hat did you do?
- **R**esults: **W**hat did you find?
- **D**iscussion: **W**hat does it all mean?

“Bowtie” Model For a Scientific Paper



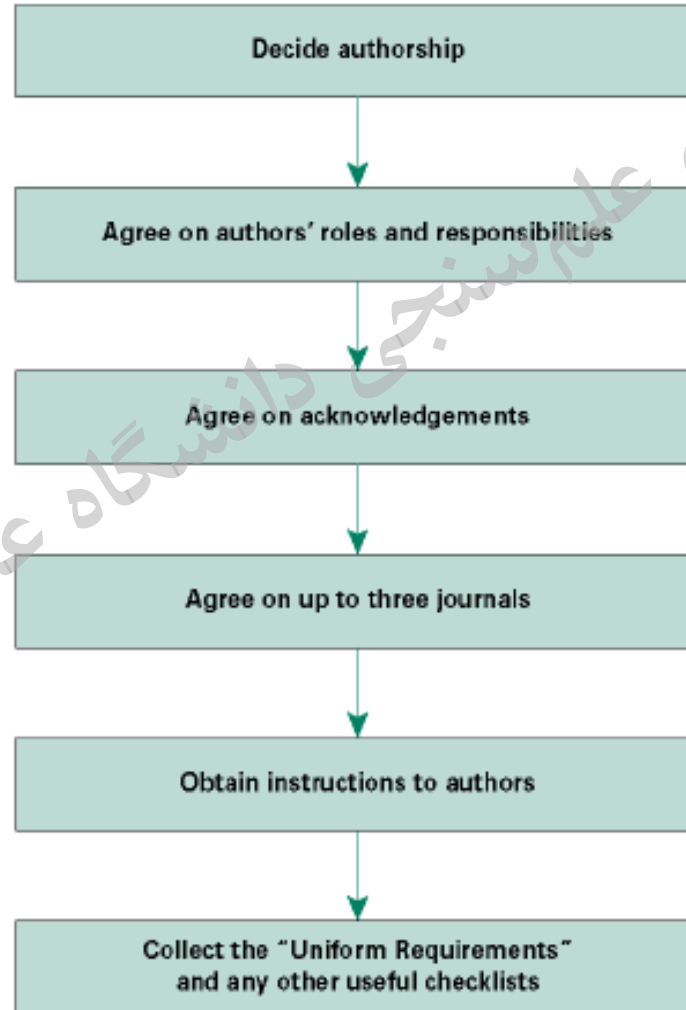
A full paper may contain:

- Title
- Authors and Affiliation
- Abstract
- Introduction
- Methods
- Results
- Discussion
- Acknowledgments (optional)
- References

Initial steps

- 1-Understand the type of manuscript you are writing.
- 2-Re-evaluate your project.
- 3-Plan the sections and subsections you need.
- 4-Match your content to your readers' knowledge.
- 5-Keep information specific rather than general.
- 6-Write in plain language. Keep your sentences short.
- 7-Use tables, diagrams, flowcharts and graphs.

Politics first!



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Order of writing?

1. Results
2. Methods
3. Introduction
4. Discussion
5. Abstract
6. References

Order of writing?

1. **Methods**
2. **Results**
3. Introduction
4. Discussion
5. Abstract
6. References

More reading

- Hall GM, ed. **How to write a paper**. London: BMJ Publishing Group.
- **Advanced Writing**, Floresita V. Bustamante, SAMT
- **Essentials of Writing Biomedical Research Papers**, Zeiger
- **Scientific Writing Easy when you know how**. Peat J. BMJ Publishing Group. 2002.
- The Vancouver Group. **Uniform requirements for manuscripts submitted to biomedical journals**. www.icmje.org

How to Write Introduction Section?

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Main Components of an Article

- **I**ntroduction: **W**hy did you start?
- **M**ethods: **W**hat did you do?
- **R**esults: **W**hat did you find?
- **D**iscussion: **W**hat does it all mean?

Introduction

- Before you begin, answer the basic questions:
 - What do I have to say?
 - Is it worth saying?
 - What is the audience?
 - What is the right journal?
 - What is the right format?

Introduction

- General, concise description of problem
 - background to the work
 - previous research
- Where that work is deficient
 - how your research will be better
- State the hypothesis

Paragraph1:
What we know

Paragraph2:
What we don't know

Paragraph3:
Why we did this study

اداره‌ی انتشارات و علمی‌پژوهی دانشگاه علوم پزشکی تهران

Introduction

1. Existing state of knowledge
2. Gaps in knowledge which research will fill.
3. State what you Intend to do & the purpose of article
4. Give related, updated & valid studies
5. Define specialized terms or abbreviations you want to use

Inverted pyramid

- The structure should funnel down from a broad perspective to a specific aim

Oxidative stress plays an important role in....

When LDL particles are oxidized ...

Antioxidants are important...

...Paraoxonase...

Introduction

- Don't make it a review article
- Don not include methods, results and discussion
- Don't put down every all previous studies & their data gaps
- Don't explain pathophysiology irrelevant to your study

Introduction

- Follow the best advice
- Keep it short
- Make sure you are aware of earlier studies
- Tell about importance of your study
- Don't baffle your readers
- Think about using journalistic tricks

Introduction

- To write an effective introduction you must:
 - Know your audience
 - Keep it short
 - Tell readers why you have done the study
 - Explain why it is important
 - Convince readers that it is better than others
 - Try to hook them!

How to Write Methods & Material Section?

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Methods

- Allows reader to judge the quality of the work
- Identifies weaknesses
- Allows repetition of the study
- State the study design & specifications

Methods

- WWWWH (who, what, where, why, when & how?)
- Define variables
- Patient/Participants inclusion
- Dates
- Randomisation/Placebo/Blindness
- Ethics/consent
- Treatments
- Outcomes and endpoints
- Statistical methods & power

Check list for Methods

- ❑ Study design mentioned?
- ❑ Who, what, where, why, how, when?
- ❑ Inclusion/exclusion criteria?
- ❑ logical & chronological order?
- ❑ Measurements defined? justified? detailed?
referenced?

Check list for Methods

- Sample size justified?
- Transformations and statistical analyses clear?
- New techniques validated properly?
- Could the reader reproduce your study from the details provided?

Methods

- ❑ What subjects/patients/animals/specimens techniques were used?
- ❑ Reason for selecting the experimental design of the study.
- ❑ Statistical methods used for analysis
- ❑ The section should be called "**Material and Methods**" only if **inanimate specimens** have been used.

(continue)

Methods

Patient / Animals / Specimens

- Numbers
- How are they grouped
- Criteria
- Informed consent obtained

Techniques

- Give enough details for readers to assess the validity of the results, and repeat the study
- If standard techniques is used, give appropriate reference, any modifications should be clearly explained
- If drug trial, clear description of trial

CONSORT Statement

- ❑ CONSORT stands for Consolidated Standards of Reporting Trials.
- ❑ It is developed by the CONSORT Group to alleviate the problems arising from inadequate reporting of randomized controlled trials (RCTs).
- ❑ The website: <http://www.consort-statement.org>

Enrollment

Assessed for eligibility (n = ...)

Excluded (n = ...)

Not meeting inclusion criteria (n = ...)

Refused to participate (n = ...)

Other reasons (n = ...)

Randomised (n = ...)

Allocation

Allocated to intervention (n = ...)

Received allocated intervention (n = ...)

Did not receive allocated intervention (give reasons) (n = ...)

Allocated to intervention (n = ...)

Received allocated intervention (n = ...)

Did not receive allocated intervention (give reasons) (n = ...)

Follow up

Lost to follow up (n = ...) (give reasons)

Discontinued intervention (n = ...) (give reasons)

Lost to follow up (n = ...) (give reasons)

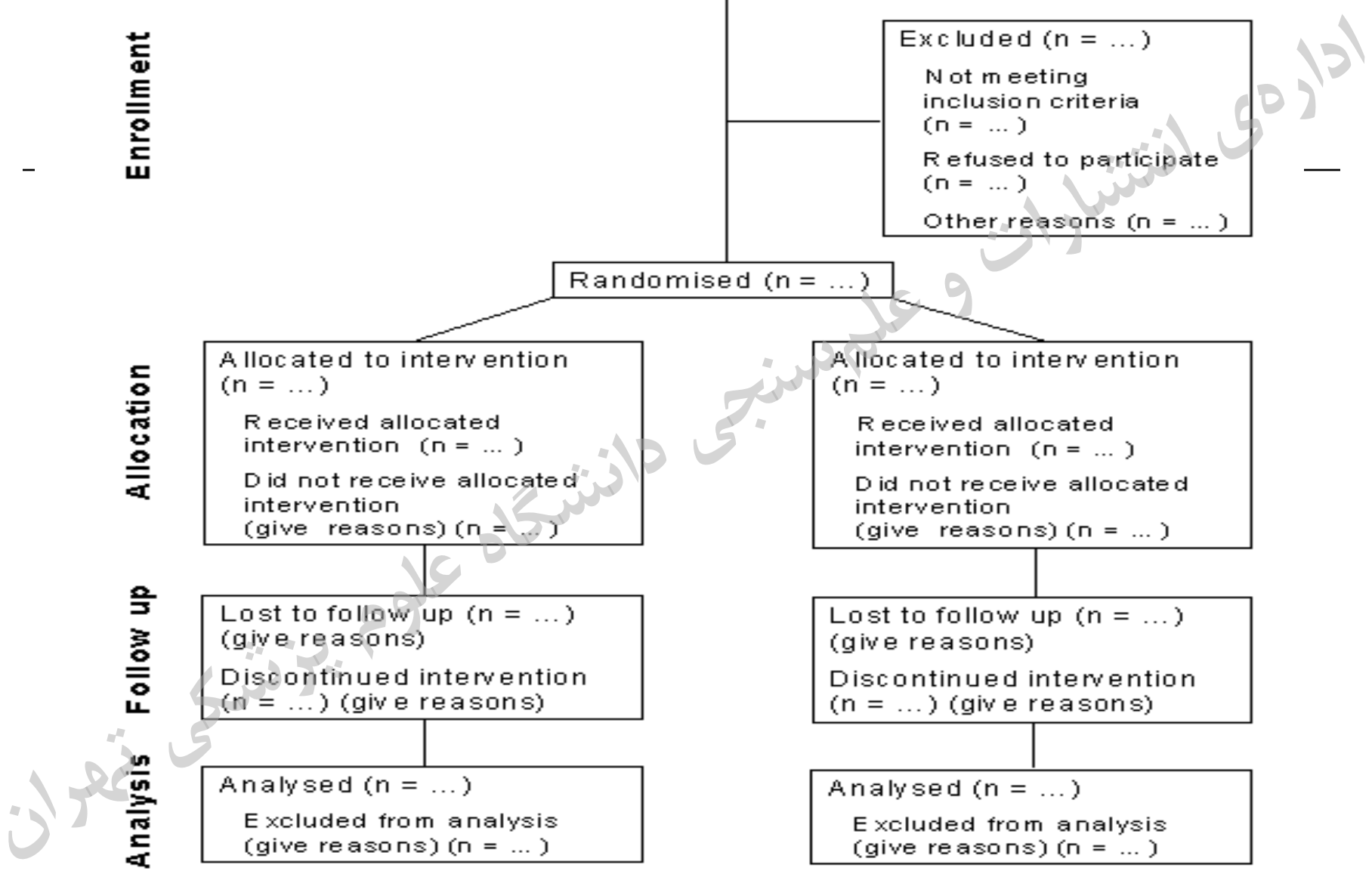
Discontinued intervention (n = ...) (give reasons)

Analysed (n = ...)

Excluded from analysis (give reasons) (n = ...)

Analysed (n = ...)

Excluded from analysis (give reasons) (n = ...)



تهران

اداره‌ی انتشارات و علم‌سنجی دانشگاه علامه تبریزی

Methods

- Study design
- Participants
- Ethical approval
- Sample size
- Questionnaires
- Interventions
- Clinical assessments
- Statistical methods

What to include in the methods section (1)

- How the study was designed:
 - Keep the description brief
 - Say how randomization was done
 - Use names to identify parts of study sequence

What to include in the methods section (2)

- How the study was carried out:
 - How the participants were recruited and chosen
 - Give reasons for excluding participants
 - Consider mentioning ethical features
 - Give accurate details of materials used
 - Give exact drug dosages
 - Give exact form of treatments

What to include in the methods section (3)

- How the data were analyzed:
 - Use a P value to disprove the null hypothesis
 - Give an estimate of power of the study
 - Give the exact tests used for statistical analysis

Results: Statistics

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Results

Simple \longrightarrow complex

- ❑ Describe the population
- ❑ Start with positive findings
- ❑ Establish how comparable your groups were
- ❑ Use a mixture of text, tables and figures
- ❑ Mention units of measurement
- ❑ Mention what numbers, brackets, etc. refer to
- ❑ Bring and explain P values

Results

Provide only enough interpretation to lead the reader from one experiment to the other

- Avoid lengthy analysis and comparison to the work of others
- No need to follow **chronology of study**
 - Rather, provide a **logical progression** and tell a story

Results

- “Stand alone” tables
- Make sure totals add to 100%
- Do not repeat the Tables and Figures in text
 - Summarize: e.g., there were no significant associations...
 - Describe: e.g. there was a three fold increase in the risk of ..

Results

1. Start with positive findings.
2. Do not compare the present data with previously published results.
3. Write the text of the Results section concisely and objectively.

Tables and Figures

- Consider using a table to present **large amounts** of data/results.
 - Must refer to all tables in text.
- Use **figures** to graphically represent *significant* results.

Tables and Figures

- Tables and Figures are **assigned numbers** separately and in the sequence that you will refer to them from the text.
 - The first Table you refer to is Table 1, the next Table 2 and so forth.
 - Similarly, the first Figure is Figure 1, the next Figure 2, etc.

Tables and Figures

- Each Table or Figure must include a brief description of the results being presented and other necessary information in a **legend**.
- **Table legends go above** the Table; tables are **read from top to bottom**.
- **Figure legends go below** the figure; figures are usually **viewed from bottom to top**

Table 4. Population variation in hatch success (mean percent) of unfertilized eggs for females from populations sampled in 1997. N = number of females tested.

Population	mean (%)	Standard deviation	Range	N
Beaver Creek ^T	7.31	13.95	0-53.16	15
Honey Creek ^T	4.33	7.83	0-25.47	11
Rock Bridge Gans Creek ^T	5.66	13.93	0-77.86	38
Cedar Creek ^P	6.56	9.64	0-46.52	64
Grindstone Creek ^P	8.56	14.77	0-57.32	19
Jacks Fork River ^P	5.28	8.28	0-30.96	28
Meramec River ^P	5.49	10.25	0-45.76	45
Little Dixie Lake ^L	7.96	14.54	0-67.66	71
Little Prairie Lake ^L	6.86	7.84	0-32.40	36
Rocky Forks Lake ^L	3.31	4.12	0-16.14	43
Winegar Lake ^L	10.73	17.58	0-41.64	5
Whetstone Lake ^L	7.36	12.93	0-63.38	57

^T = temporary stream, ^P = permanent streams, ^L = lakes. **---footnotes**

---Table legend

---Column titles

**---Table body
(data)**

**---Lines demarcating
the different parts
of the table**

Table 2. Log-likelihood tests of deviation from 1:1 sex ratios for nymphs collected from each population in 1997 and 1998. Values are ratios of female:male; sample sizes are in parentheses. Bonferroni corrected probabilities are shown with an asterisks.

Population	Year	
	1997	1998
Beaver Creek ^T	9.00:1(20)***	2.67:1 (22)*
Honey Creek ^T	9.00:1(56)***	2.27:1 (98)***
Rock Bridge ^T	3.33:1(26)**	2.09:1 (68)**
Cedar Creek ^P	2.05:1(119)***	1.87:1 (198)***
Grindstone Creek ^P		2.26:1 (140)***
Jacks Fork River ^P	2.89:1(35)**	5.17:1 (37)***
Meramec River ^P	2.80:1(38)**	2.41:1 (58)**
Little Dixie Lake ^L	2.45:1(494)***	2.46:1 (384)***
Little Prairie Lake ^L	2.38:1 (71)***	2.08:1 (157)***
Rocky Forks Lake ^L	2.55:1 (213)***	2.93:1 (299)***
Winegar Lake ^L	3.41:1 (207)***	2.34:1 (204)***
Whetstone Lake ^L	2.69:1 (381)***	2.01:1 (268)***

* significant at $p < 0.05$; ** significant at $p < 0.005$; *** significant at $p < 0.001$.

^T = temporary stream, ^P = permanent streams, ^L = lakes.

Tables and Figures

- When referring to a table *from the text*, "Figure" is abbreviated as Fig., e.g., Fig. 1.
- Table is never abbreviated, e.g., Table 1.

Figures

- Figures are visual presentations of results, including graphs, diagrams, photos, drawings, schematics, maps, etc.
- Graphs are the most common type of figure.
- Graphs show trends or patterns of relationship.

Figures

- ✓ Avoid clutter (too many numbers or symbols)
- ✓ Should provide a clear statistical message
- ✓ Vertical (“Y”) axis: outcome/dependent variable
- ✓ Horizontal (“X”) axis: exposure/independent var.

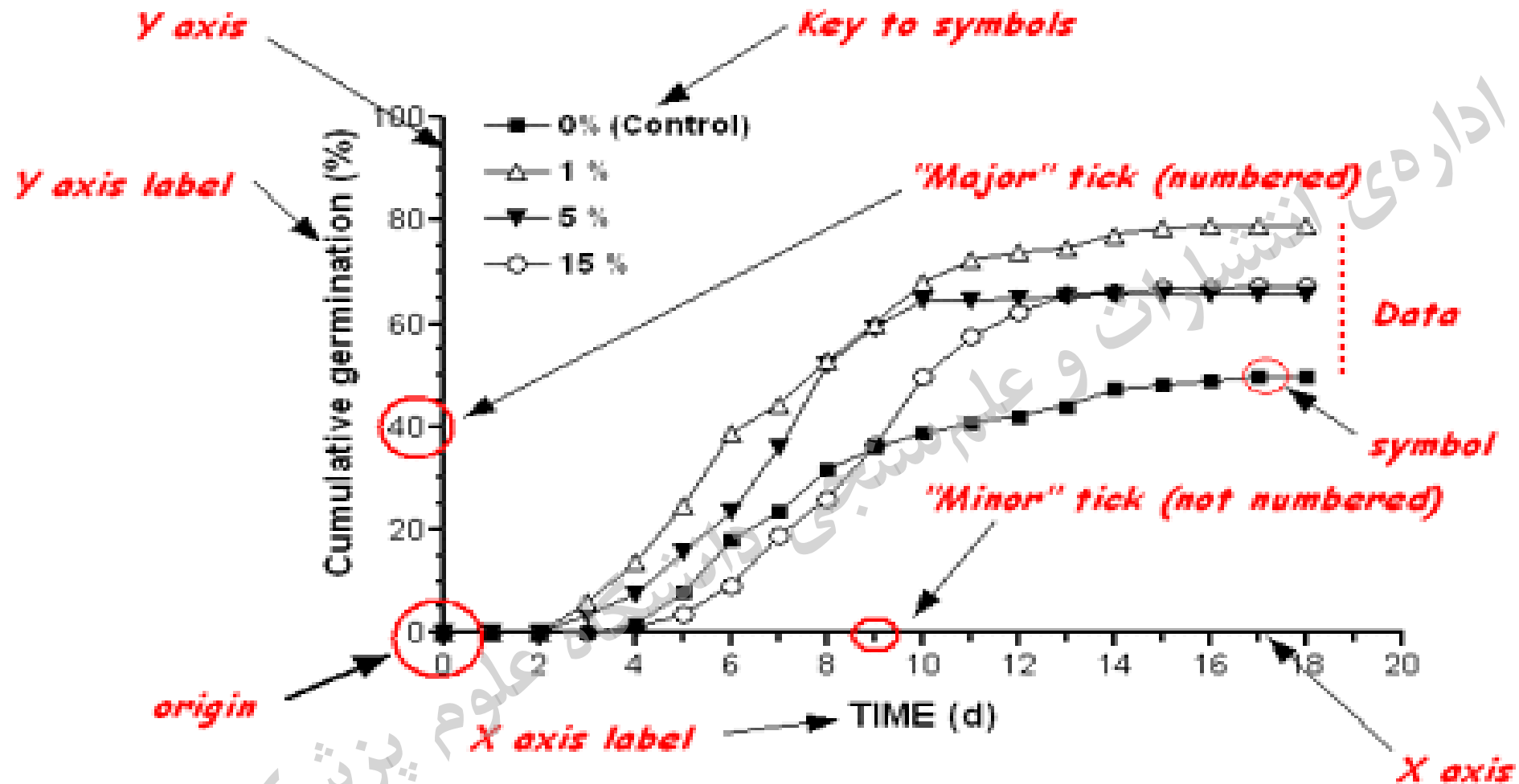


Figure 1. Cumulative germination of *Chenopodium* seeds after pregermination treatment of 2 day soak in NaCl solutions. n = 1 trial per treatment group (100 seeds/trial.)

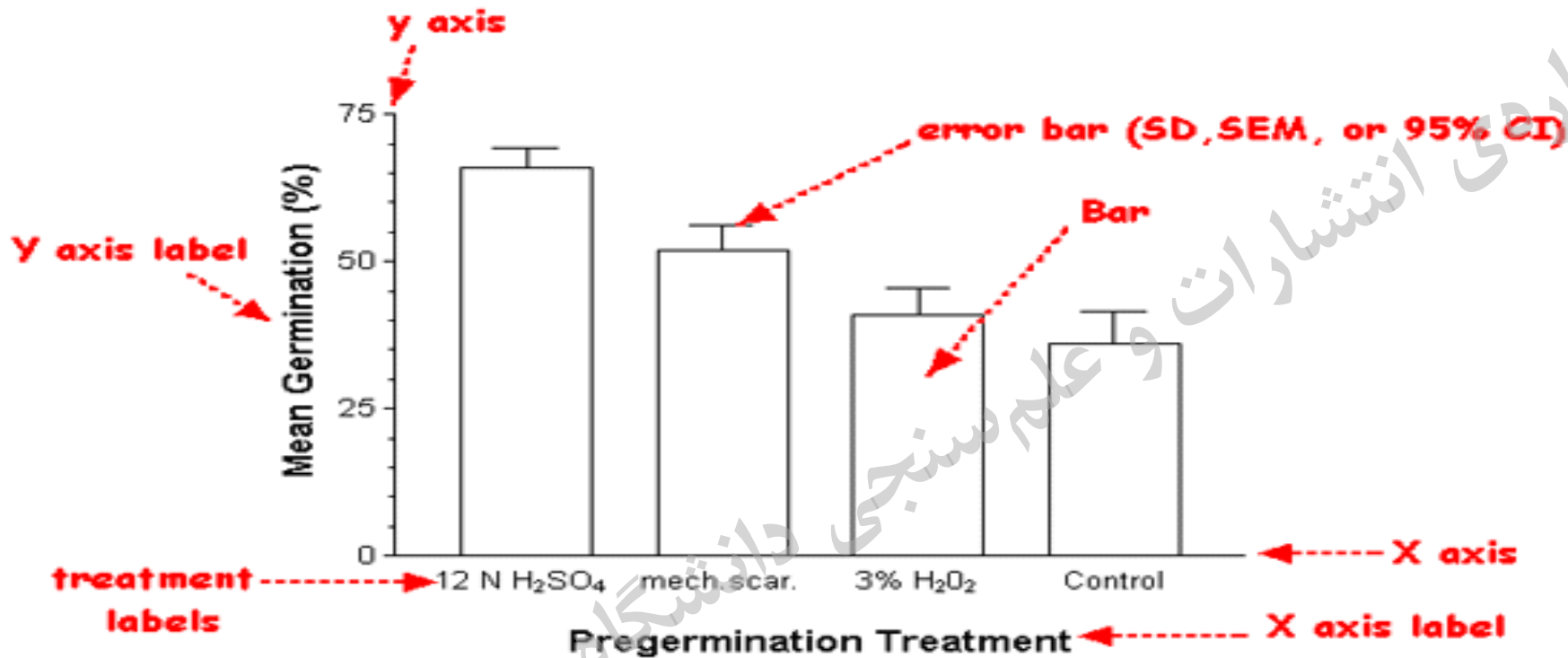


Figure 1. Mean germination (%) of gourd seeds following various pregermination treatments. N=10 groups of 100 seeds per treatment and control. Treatments: 12 hour soak in 12 N H₂SO₄, 90 second scarification of seed coat with 80 grit sandpaper, 6 hour soak in 3% H₂O₂.

Number of Seeds

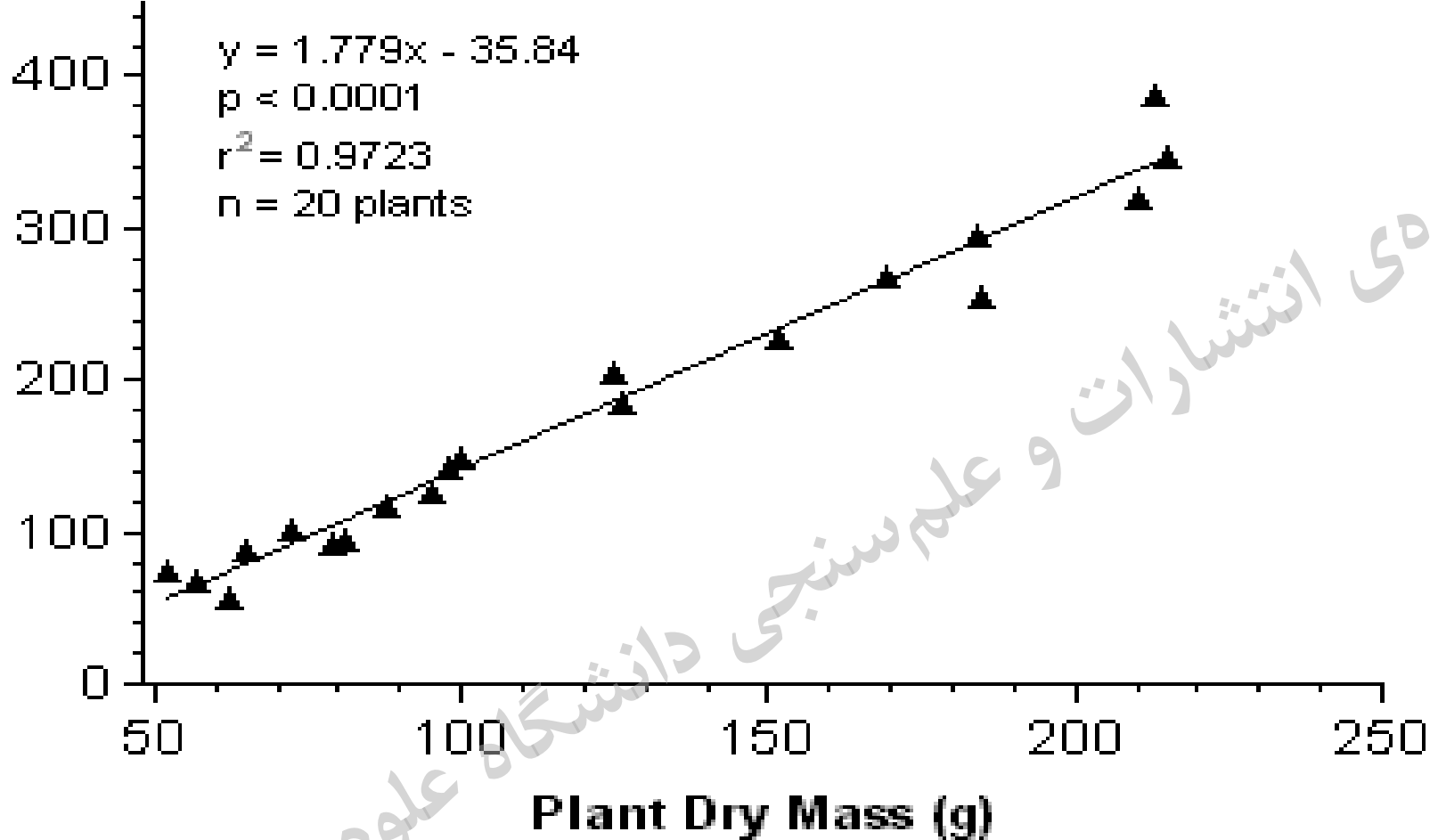


Figure 3. Seed production as a function of plant biomass in waterlilies (*Nuphar luteum*) harvested from Great Works Pond in Northern Maine in August, 2001.

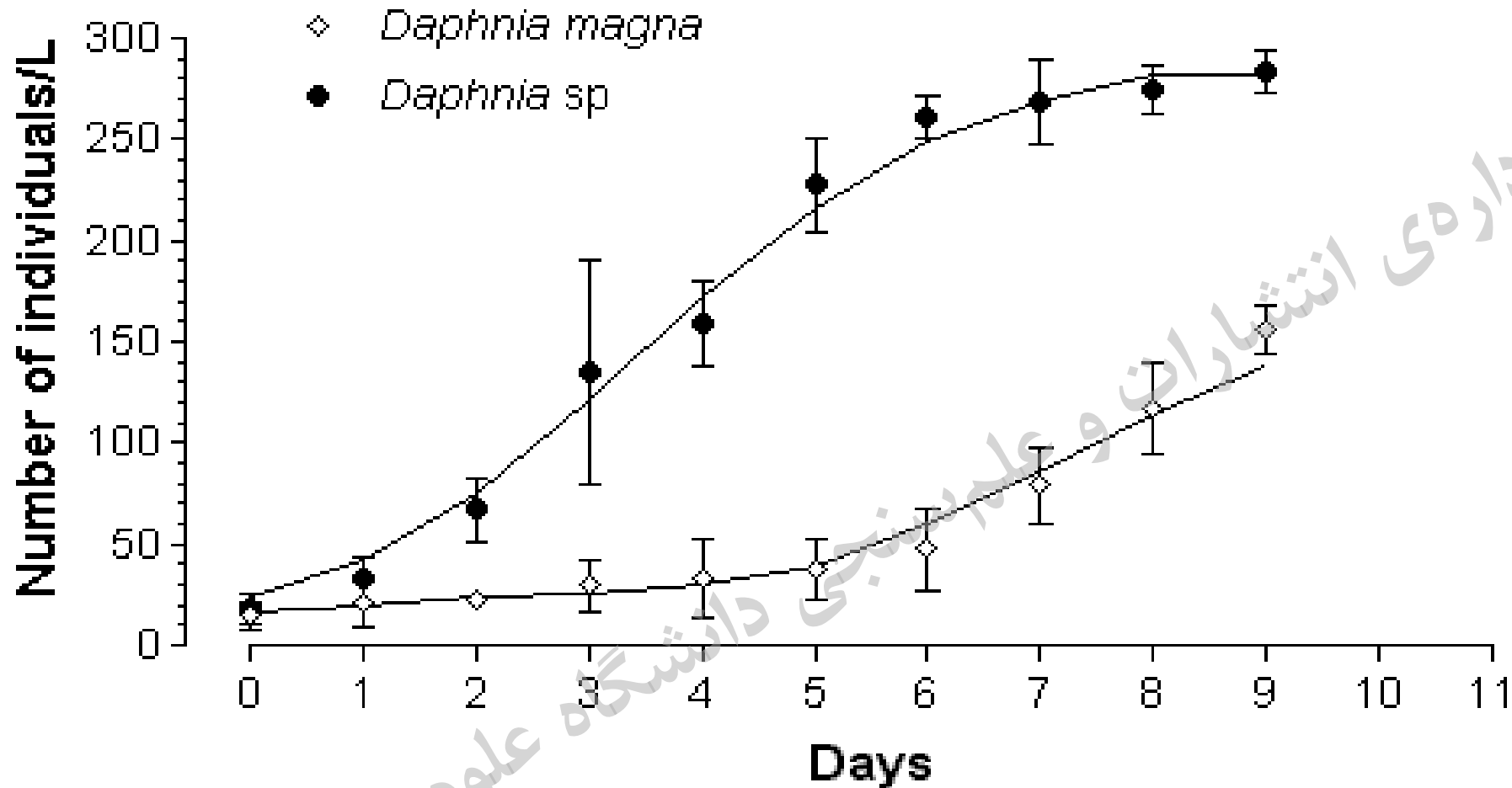


Figure 2. Mean population density (± 1 standard deviation) of two species of *Daphnia* following artificial eutrophication of a small farm pond by application of organic fertilizer. Six replicate 1 L water samples were drawn from 50 cm depth at 1100 hr each day.

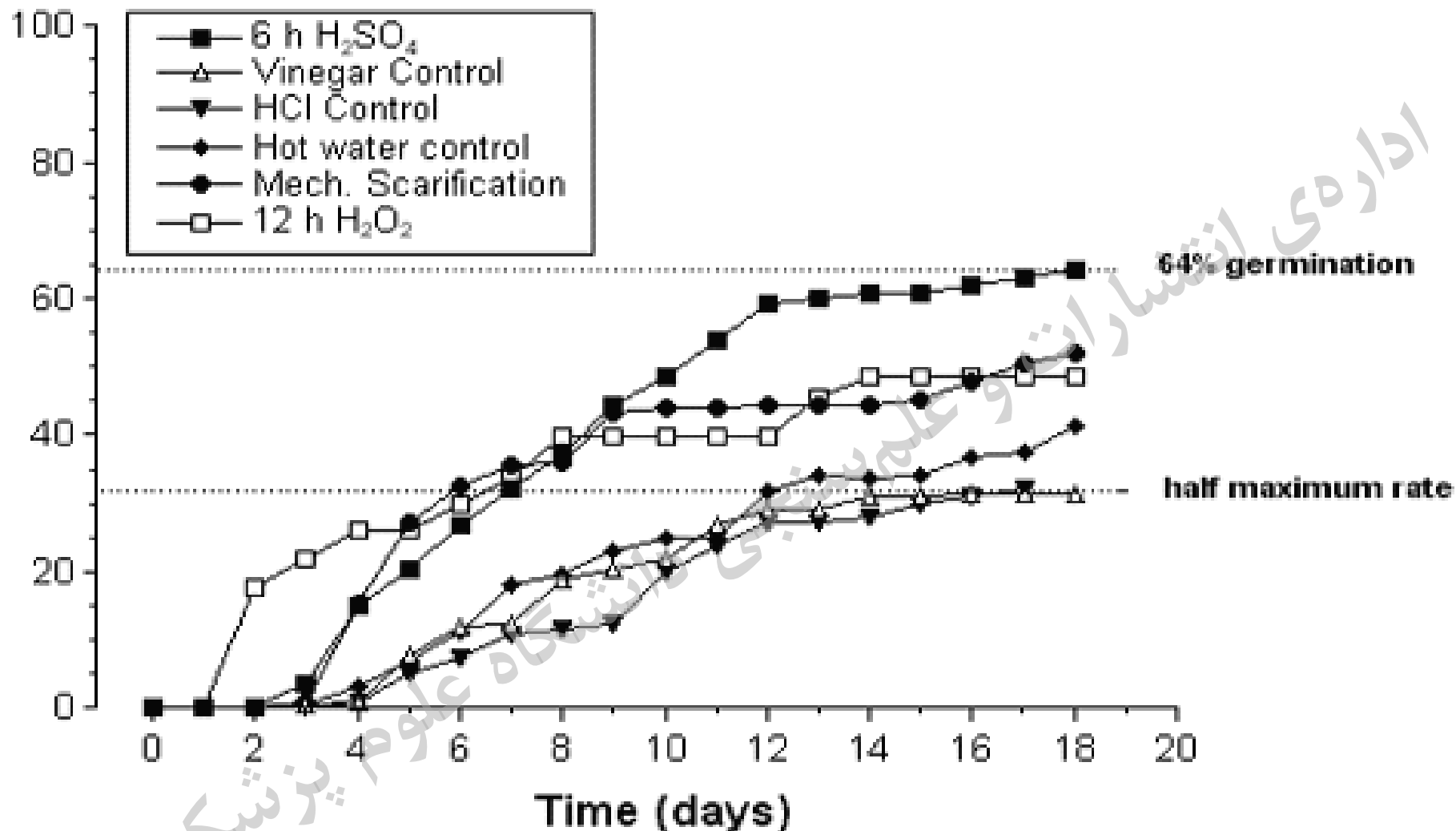


Figure 2. Cumulative germination of gourd seeds following various pregermination treatments. n = 100 seeds per trial.

Something to avoid

- ❑ Do not present the same data in **both a Table and Figure** - this is considered redundant and a waste of space and energy.
- ❑ Decide which format **best shows** the result and go through it.
- ❑ Do not report raw data values when they can be summarized **as means, percents**, etc.

Do NOT !

- Use big words that you do not really mean
 - Attributable
 - Causality
 - Efficacy
 - Significant (without statistical evidence)
 - Validity
- Mix incidence and prevalence
- Mix frequency, rate, proportion, ratio

Results

- Common mistakes
 - Raw data
 - Redundancy
 - Discussion and interpretation of data
 - No figures or tables
 - Methods/materials reported

Figure: *Before*

Figure 1. Effect of total alkaloid fraction of methanolic extract on mean survival time

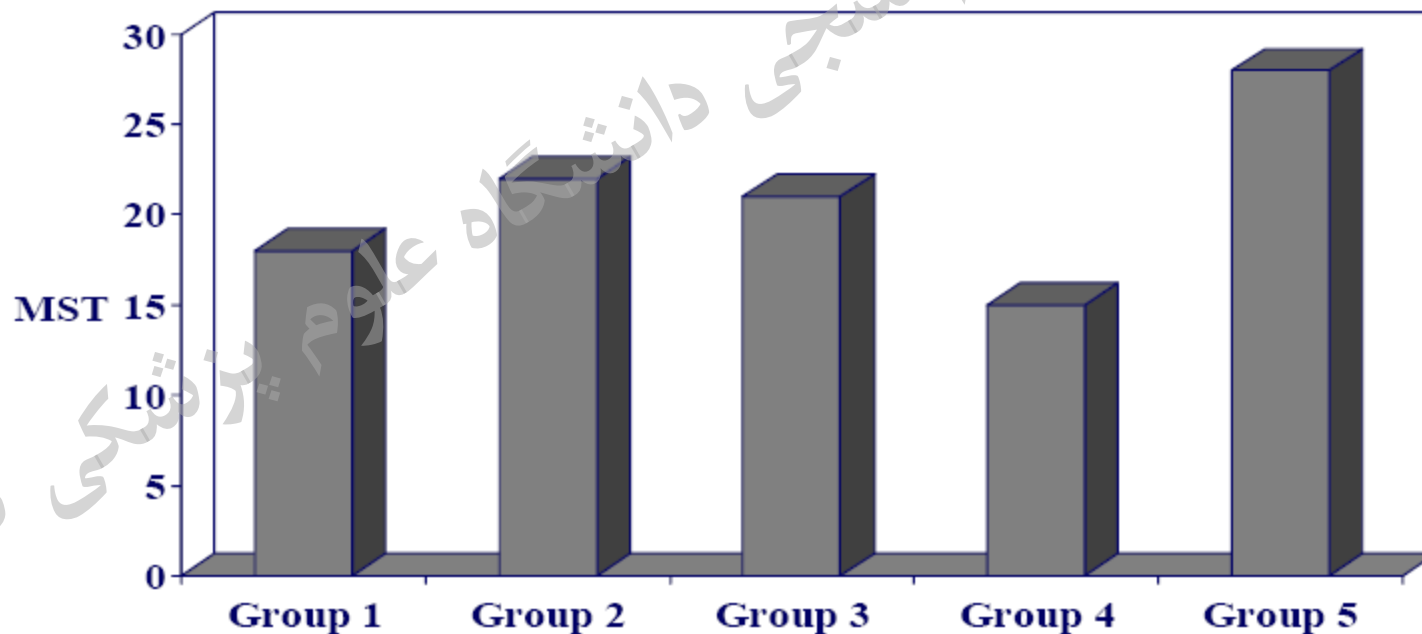


Figure: *After*

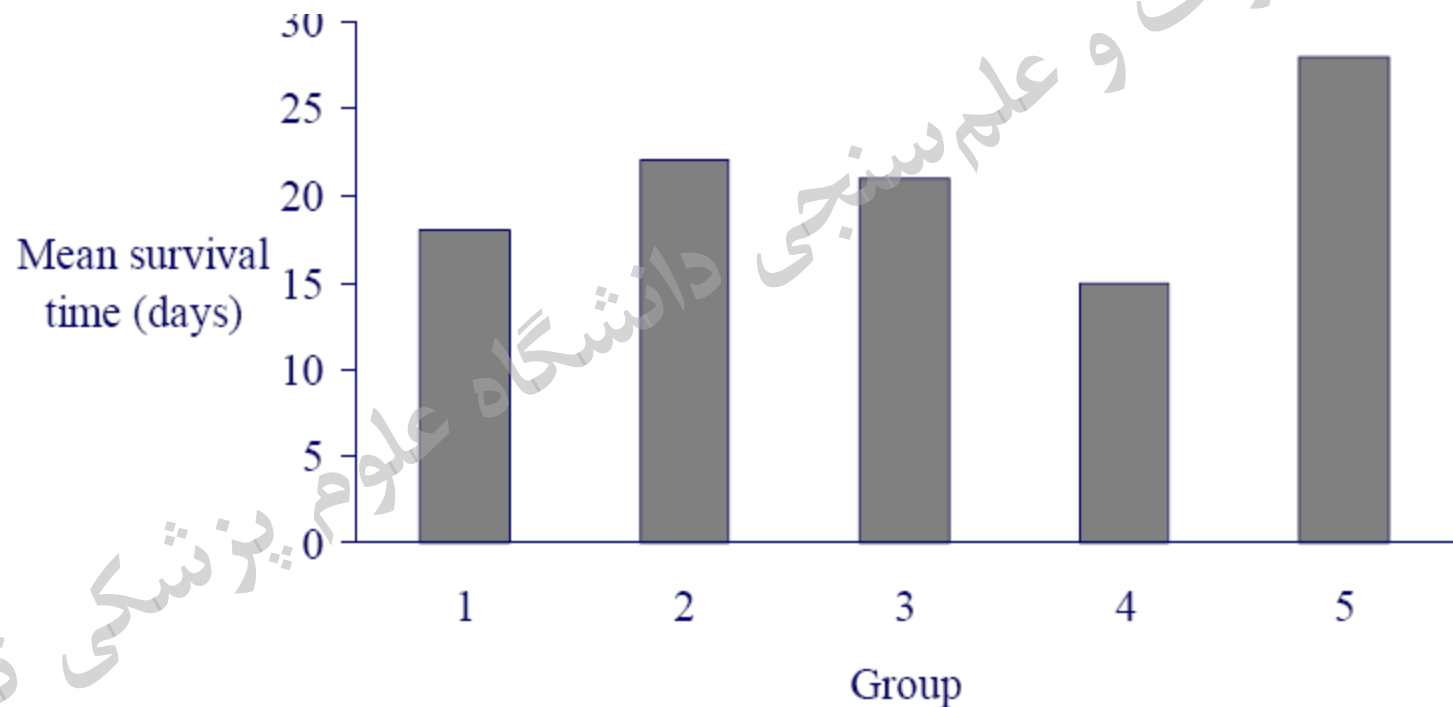


Figure 1. Effect of total alkaloid fraction of methanolic extract of unripe fruit of *Solanum pseudocapsicum* on mean survival time (MST) in tumor bearing mice.

Figure: *Example*

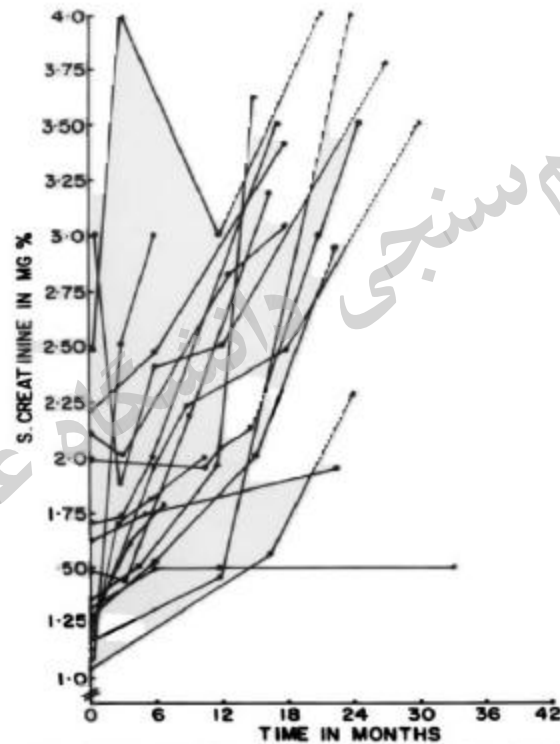


FIG. 2 : S. CREATININE LEVELS ON FOLLOW-UP IN GROUP I PATIENTS

Recommend

- **Look at recent issue of journal**
- **Use a similar published figure as a template**
- **Read journal instructions**
- **Read Vancouver style (www.icmje.org)**

گزارش نتایج آماری

- نوشتن تعداد فراوانی همراه با درصدها وقتی تعداد نمونه اندک است.
- عدم نیاز به نوشتن فرمول‌ها
- نوشتن شاخص آزمون و مقدار آن همراه با درجه آزادی و p-value
- ارائه پارامترهایی که آزمون شده‌اند مانند میانگین، نسبت یا درصد، ضریب همبستگی، حتی اگر آزمون‌ها معنی‌دار نشده باشند.
- تعریف کردن علائمی که برای نتایج معنی‌دار به کار می‌رود (مانند ستاره) و به کار بردن علائم مشابه

گزارش نتایج آماری

- نوشتن مقدار دقیق p-value برای آزمون‌های معنی‌دار و غیرمعنی‌دار (تا دو رقم اعشار)
- نوشتن اعداد به صورت گرد شده با در نظر گرفتن دقت داده‌های اولیه (میانگین تا یک رقم اعشار و انحراف معیار و خطای معیار تا دو رقم اعشار بیشتر از داده‌های خام)
- درج درصدها تا یک رقم اعشار (گاهی حتی نیاز به ارقام اعشاری هم نیست).
- نوشتن شاخص‌هایی مانند r , t تا دو رقم اعشار

The p-value in a nutshell

Could the result have occurred by chance?

The result is **unlikely** to be due to chance ← → The result is **likely** to be due to chance

0

$p < 0.05$
a statistically significant result

$p > 0.05$
not a statistically significant result

$p = 0.05$

$\frac{1}{20}$ or 1 in 20
result fairly unlikely to be due to chance

$p = 0.5$

$\frac{1}{2}$ or 1 in 2
result quite likely to be due to chance

Check list for Results

- ❑ Baseline data provided?
- ❑ Primary and other endpoints clear and complete?
- ❑ Does the text complement figures and tables?
- ❑ Are measures of uncertainty mentioned? (SD, SE, CI)

Mechanics of Writing-Results

- Tell a story
- Use the most logical sequence to present the data (not necessarily the order in which you did the experiments)
- Just report the data - do not include interpretation or comparison to literature
- No duplication of data

Guidelines for Writing Results - The Study as it was Conducted

- Specify the **dates** of the study
- Describe the **characteristics** of each group
- Indicate if the sample is **representative**
- Indicate if **randomization** was successful
- Describe duration and nature of **follow up**

Guidelines for Writing Results: The Study Outcomes

- Present the results for all primary endpoints
- Report statistical findings in detail
- Report actual p values , 95% CI , etc.
- Report the main findings in figures or tables, *you don't need to also report them in the text*
- Report confounders

A Few Rules

- Look for redundancy within the manuscript
- Try not to use “it” or “they” - be specific!
- No jargon
- Two shorter sentences are frequently much more effective than a long, complex sentence
- “Data” is plural not singular, i.e., “the data are...”
NOT “the data is...”

A Few Rules - continued

- Capitalize people's names, i.e., Golgi apparatus
- Never, ever plagiarize! (even from yourself!)
- Use numbers when expressing measurements, except when the number would begin a sentence.

Results: Statistics

- To avoid bias in your results, it is essential to use the correct statistical tests
- The best time to consult a statistician is at an early point in planning your study and not once the data analyses have begun

Results: Statistics

- A statistician can help to guide you:
 - to prevent from wasting many hours in analysing data in the wrong way
 - framing analyses
 - choosing the correct statistical test to use
 - interpreting the results

Results: Statistics

- to describe the data distribution, you must use the correct measures of central tendency and spread:
 - Normally distributed data: Mean & SD
 - Skewed data: Median & Interquartile range
- In figures and tables, you must always explain whether you are using:
 - the SD as a measure of spread
 - the SE or 95% CI as a measure of precision

Results: Statistics

In general:

- SDs are the correct measurement to describe baseline characteristics
- SEs and CIs are the correct measurements to describe precision

Results: Statistics

- It is important always to use the abbreviation SD, SE, or CI to define which statistic you are presenting and to avoid using an ambiguous \pm or $+/-$ sign

Results: Statistics

Table 3.6 Statistical definitions for central tendency, spread and precision.

Definitions

Central tendency

Mean (average)

Measure of the centre of the data
($\Sigma x/n$)

Median (centre)

The point at which half the measurements lie below and half lie above. Calculated by ranking measurements in order.
Median = observation at the middle of the ranked data

Results: Statistics

Spread

Standard deviation (SD)

95% of the measurements lie within two standard deviations above and below the mean

$$SD = \sqrt{\text{variance}}$$

$$\text{Variance} = \sum (x_i - \bar{x})^2 / n - 1$$

Range

Lowest and highest value

Calculate by ranking measurements in order

Interquartile range

Range of 25th to 75th percentiles

Calculate by ranking measurements in order

Results: Statistics

Precision

Standard error (SE)

Estimate of the accuracy of the calculated mean value

$$SE = SD/\sqrt{n}$$

95% confidence interval (CI)

Interval in which we are 95% certain that the “true” mean lies

$$95\% \text{ CI} = \text{mean} \pm (SE \times 1.96)$$

Results: Statistics

- Many researchers choose to use the standard error either as a measure of distribution or as an error bar in figures.
- However, the standard error is not a descriptive statistic and **must not** be used as such

Results: Statistics

- Journal policies on quoting P values vary widely but, if in doubt, **always quote P values exactly.**
- In tables, put $P = 0.043$ not $P < 0.05$, and use $P = 0.13$ not “NS” for indicating a lack of statistical significance
- give your readers the opportunity to evaluate the magnitude of the P value in relation to the size of your study and the difference between groups that you found

Results: Statistics

- Describing the P value as “NS” or “ $P > 0.05$ ” can be misleading if the actual value is marginal, say 0.07, but the difference between groups is **clinically important**.
- Giving the exact value allows readers to make their **own judgements** about whether it is possible that a type I or type II error has occurred.

Results: Statistics

In summary

- Be Simple and Transparent as much as possible!!

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Writing Discussion Section

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Main Components of an Article

- **I**ntroduction: **W**hy did you start?
- **M**ethods: **W**hat did you do?
- **R**esults: **W**hat did you find?
- **D**iscussion: **W**hat does it all mean?

How to Write Discussion



Discussion

- ❑ Seven or eight paragraphs of three or four sentences each
- ❑ State what you found
- ❑ Outline the strengths and limitations of the study
- ❑ Discuss the relevance to current literature
- ❑ Outline your implications with a clear “So what?” and “Where now”

Paragraph1
What did this study show

Paragraph2
Strength & weaknesses of methods

Paragraph3 to n-1
How results support or refute current literature

Final paragraph
Impact on current thinking or practice

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Paragraph1:

What did this study show

- A brief summary of what you really found and why it was important
- Explain how it will add to current knowledge or change health care
- Good phrases to begin with are:
 - *The results from this study showed that ...*
 - *Our results indicate that ...*
 - *and we found that ...*

Paragraph1

Do not waste entire sentences restating your results; if you need to remind the reader of the result to be discussed, use "bridge sentences" that relate the result to the interpretation:

"The slow response of the lead-exposed neurons relative to controls suggests that...[interpretation]" .

Paragraph2: Strength & weaknesses

- Be honest
- No research is ever perfect
- How chance, bias, or confounding may have influenced your results
- How you minimized this possibility
- How your research is better than what has gone before

Paragraph 3 to n-1:

Compare with current literature

- How your results agree or disagree with other studies and with other related theories
- Compare with highly relevant and scientifically valid studies
- References to the literature need to be both focused and brief

Final paragraph: Implication of your findings

- Never generalize your results beyond the bounds of the type of participants included in your study
- The most disappointing papers are those in which the conclusions are not backed up by the data
- Do not be too tentative if you found a strong association between the exposure and outcomes that you were investigating:
 - *Our results suggest that vitamin consumption could be associated with a decreased risk of respiratory illness...*

The function of the Discussion is:

- ❖ Write Briefly & summarize your principal finding
- ❖ Limitations of your study
- ❖ Interpret findings in light of the literature
- ❖ Implications of your results for other researchers
- ❖ Conclusions

Discussion

- ❑ Construct parallel to results
- ❑ Interpretation of data
- ❑ Relate your results to the findings of other investigators
- ❑ Summary paragraph at end - include significance of results
- ❑ Avoid redundancy with results and introduction sections

Summary

- ❑ Be consistent with target journal's style
- ❑ Write about main findings
- ❑ Summarize relevant important previous work
- ❑ Put your results in context
- ❑ Mention doubts, weaknesses, and confounders
- ❑ Three ways of ending: problem solved, more research needed, or uncertainty remains

Discussion

1. Organize the Discussion to address **each** of the experiments or studies for which you presented **results**
2. Discuss each in the **same sequence** as presented in the Results, providing your interpretation of what they mean in the larger context of the problem

Good discussions ...

- ❑ Address every key finding of the study
- ❑ State why this study is different
- ❑ State why the results concur/ disagree with current knowledge
- ❑ Justify differences
- ❑ Point out future directions/ continued knowledge gaps

How to Write Abstract Section?

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The Abstract

- The function of the abstract is **to provide an overview of the paper.**
- The overview should present the main story and a few essential details of the paper for readers who read only the abstract and should serve as both a **clear preview and a clear, accurate recapitulation of the main story** for readers who read the paper.
- Thus, the abstract should **make sense both when read alone and when read with the paper.**



Abstracts

- The abstract should be neither vague and general on the one hand nor fussily detailed on the other. It should be specific and selective.

Abstracts

The abstract of a paper should state concisely:

- the **question** that was asked,
- what was done **to answer** the question,
- what was **found** that answers the question,
and
- the **answer** to the question.

Abstracts

- Most journals limit the length of the abstract (usually to 250 words or less) “Uniform Requirements for Manuscripts Submitted to Biomedical Journals”
- For un-structured abstracts, limit the abstract to 150 words or less.
- If no limit is stated, make your abstract no longer than the abstracts in recent issues of the journal.

In summary:

- The abstract should provide an **overview of the main story** and a **few essential -details**.
- The abstract should be **clear** both to readers **who read the paper** and to readers **who do not read the paper**.

Abstract Writing

- Write the abstract as one paragraph.
- Use the techniques of continuity to make the paragraph flow. Use signals to indicate the parts of the abstract:
- Signal what you found by "**We found that**" or something similar.

Abstract Writing

- Signal the answer by "We conclude that" or "Thus" or something similar. Signal implications by "We suggest that" or something similar.
- The question and what was done can usually be written in one sentence in "the form "To determine X, we. ..." If the question and what was done are in separate sentences, use signals such as "We asked whether. ..." (question) and "To answer this question, we. ..." (what was done).

Abstract Writing

- Write short sentences.
- Use simple words. Avoid jargon. Avoid abbreviations. Keep the abstract short.
- Omit less important information (experimental preparation, confirmatory results, comparisons with previous results, data for less important variables, definitions, background, implications).

Abstract Writing

- Omit unnecessary words (use "Thus" instead of "We conclude that"; use an adjective or an apostrophe instead of an "of" phrase: for example, "*ductal* rings" instead of "rings of ductus arteriosus," "*rings'* sensitivity" instead of "sensitivity of the rings"; but do not omit "a," "an," or "the" when they are necessary).

Exceptions

- If the journal to which you are submitting a paper requests a different form for the abstract, follow the requested form.

Keywords

- ❑ Select terms that you would look up to find your own paper and that would attract the readers you hope to reach.
- ❑ Select current, specific terms, preferably medical subject headings (MeSH), that name important topics in your paper .
- ❑ Use phrases as well as single words.
- ❑ If the journal asks you to supply only terms that are not in the title of the paper, do so
- ❑ If necessary, include a term as an indexing term even if the term does not appear in your paper .

Check list for Abstract

- ❑ Background, methods, results, discussion?
- ❑ Anything that does not appear in full text?
- ❑ Results in words?
- ❑ Conclusion: justified? objective?
- ❑ Meaningful interpretation
- ❑ Follows the guidelines