How to write a paper

Dr. Kamran Yazdani, MD, MPH PhD

Vali Baigi

Special thanks to: Dr. Payam Kabiri, Dr. Leila Ghalichi, Dr. Gholamreza Khalili and Hamid Reza Tohidi

Office of Publications & Scientometrics

Tehran University of Medical Sciences

How to write a paper

Scientific Writing in Medical Sciences (An Overview)

Kamran Yazdani, MD MPH PhD

Assistant Professor of Epidemiology

Department of Epidemiology & Biostatistics, School of Public Health
Tehran University of Medical Sciences

Research Output

- Three different research output are expected from research proposals:
  - Paper
  - Patent
  - Change

Why "Scientific Writing"?

- The purpose of **scientific writing** is to convey ideas and facts about scientific work.
- Scientists understand and criticize each other's work through their articles.
- Thus, **scientific writing** should be intelligible to readers at the first reading.

"What is written without effort is in general read without pleasure."

Samuel Johnson (1709–1784)

Why Publish?

- Knowledge contributions
- Ensures scientific rigor
- Allows feedback (improves work)
- Promotes career
  - Document productivity
  - Document impact on field/reputation
  - Advertises your lab for future trainees
- Improves chances of funding
- Fulfills an obligation (public monies)

- Scientists communicate the fruits of their labour mostly in writing, and mostly in scientific journals. Conferences and other forms of verbal communication, including the evening news, play an important role but the written word reaches the widest audience and constitutes the archival message.

Kenneth Rothman

- To improve your chances of being published, your study must have a
  - Rigorous design,
  - Your results must answer an important question,
  - Your paper must be written well
- A well-designed and well-reported study is always a good candidate for being accepted by a respected journal

Evaluating an Academic Person through his/her CV Papers

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

The Art of Scientific Writing

- ✓ **Publish or Perish!**

Steps in Scientific Writing

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

Politics first!

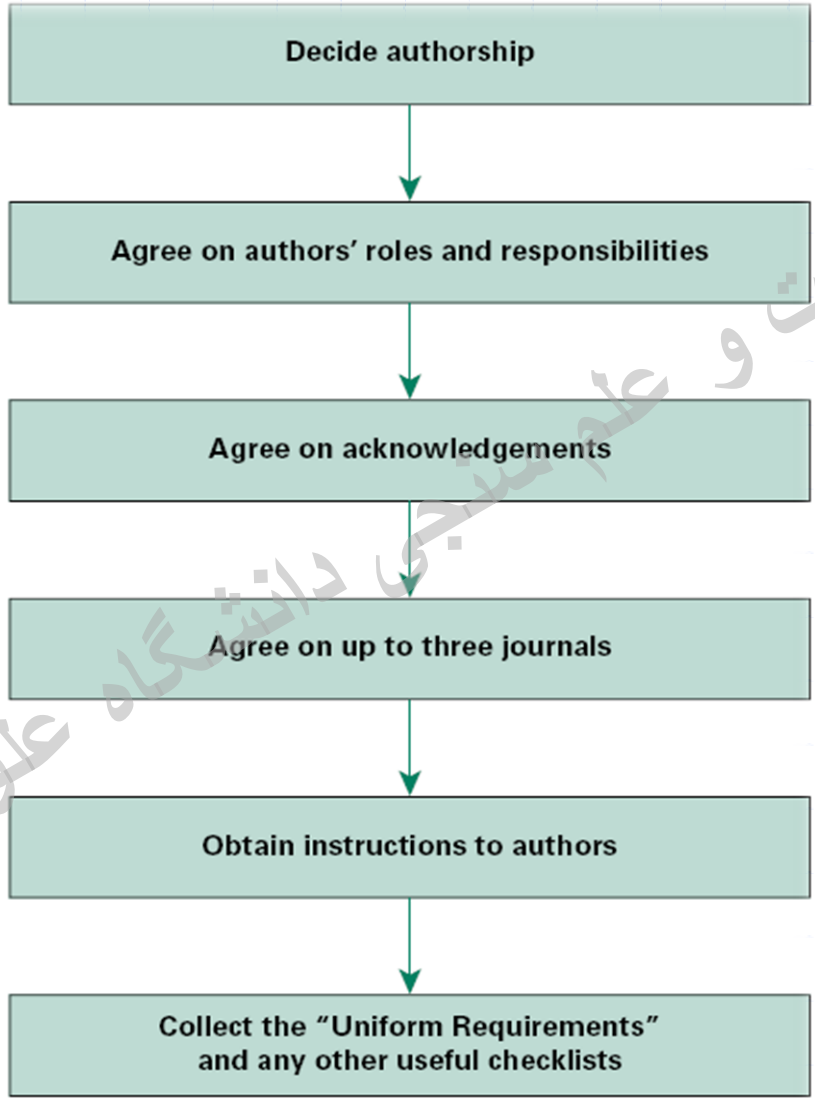
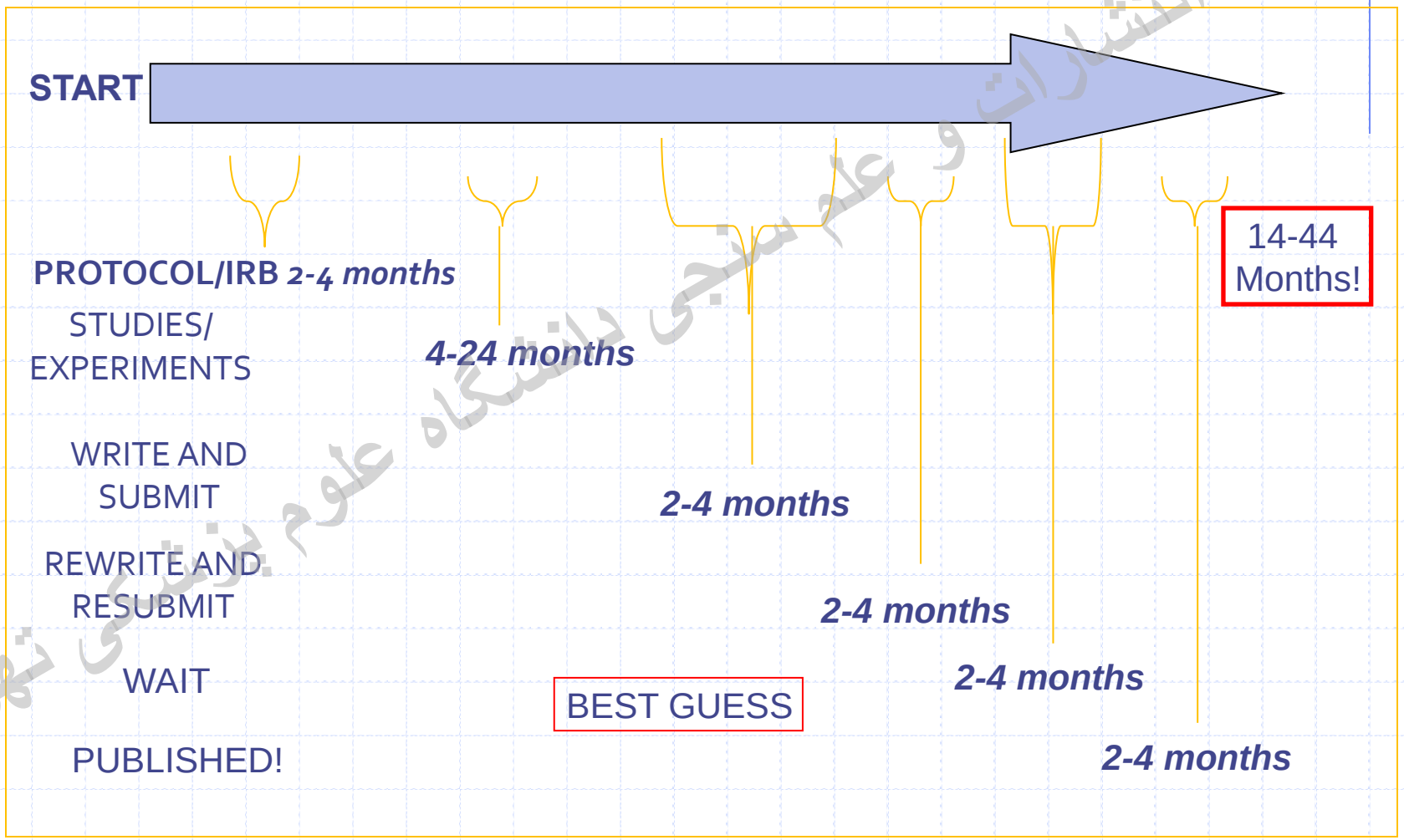


Figure 2.3 Sorting out the politics before you begin writing.

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 The Editor
- Personal Views

Narrative Reviews

- Narrative reviews are usually written to:
  - address new developments
  - summarize recent literature
- Who should write a narrative review?
  - Narrative reviews are an expert opinion that is an extension of current thinking and not a definitive evaluation of the literature

Case Report

- Medical history of a single patient in a story form.
- Patient with a disease or unusual condition
- e.g. Thalidomide

Topics that may be reported in case reports

- Clinical conditions that have not been described before
- Unusual and unreported presentations of known clinical conditions
- Unexpected beneficial responses to a treatment
- Previously unreported adverse reactions to a treatment
- Errors in diagnosis as a result of use of incorrect tests or presentation with unusual symptoms
- New uses of a diagnostic tool or use of novel diagnostic tools
- Phenotypes associated with a newly found gene

Editorial

Some Types of Editorial:

- Editorial Salesmanship
  - Discuss why they chose to publish a lot about a specific topic and occupy the pages.
- The Editor's Opinion
  - Writing about a new and important topic (*hot topic)*
- Editorial Comment Regarding a Published Study
- Sharing Special Insight

Letter to The Editor:

- Give some comments on a published paper (agreement, disagreement, concern).
- Letters to the editor are a wonderful vehicle for the aspiring medical writer.
- Author should not be a distinguished professor
- No original research study is needed
- A reasonable chance of publication

Short communication, Short report or brief

- Increasingly common
- It is similar to writing an extended abstract.
- Concise introduction
- Present data and discuss it shortly
- Only a few tables or figures
- Number of words limitations.

Hierarchy of studies

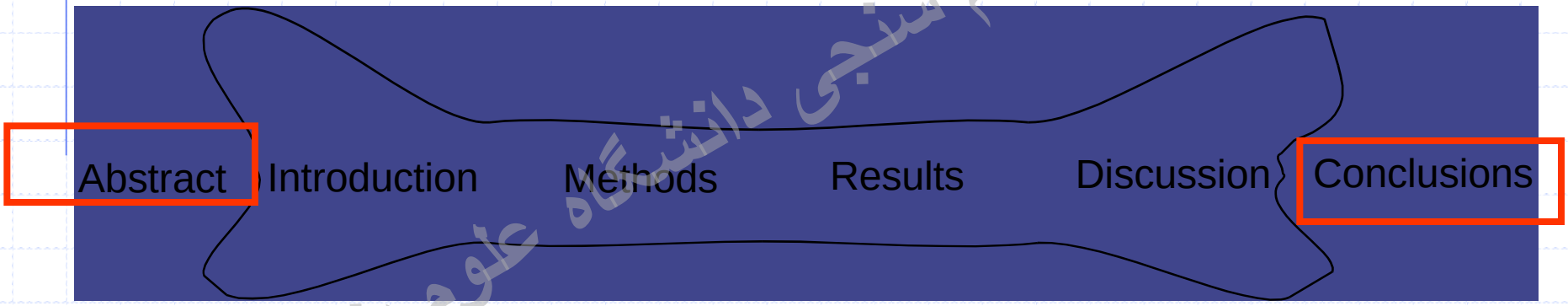
The traditional IMRaD

- Introduction
- Methods
- Results
- Discussion

Main Components of an Article

- Introduction: Why did you start?
- Methods: What did you do?
- Results: What did you find?
- Discussion: What does it all mean?

“Bowtie” Model For a Scientific Paper



Broad Ideas → Specific Ideas → Broad Ideas

A full paper may contain :

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

Order of writing?

What do you think?

Order of writing?

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

OR

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

- Generally keep it short and to the point. It is not a novel you are writing. If you get stuck, take a break. Leave the draft by your bedside. Sometimes a phrase just comes to you and it is a shame to lose it.

Anthony David

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 biomedial journals.** www.icmje.org

How to Write a Paper

The Message

Vali Baigi

Department of Epidemiology & Biostatistics
School of Public Health
Tehran University of Medical Sciences

Understand the process of medical publication

What would you consider as the key determinant of getting your paper into the target journal?

- Research idea
- Team, research organisation
- Analysis
- **Message**
- Paper
- Peer-reviewers
- **Journal editor!**

The message determines everything else

- Imagine you want to excite a friend about your work
- How do you tell them in a sentence what your study has shown?
- Think of the EDITOR!

Step 1: Define the key message of your paper

- One sentence only;
- about 12-16 words,
- 1 verb, statement,
- not a question or title

Your message

- You have no clear message? Perhaps not ready for writing a paper
- You have more than one message? Which one is the most important one? Do you need more than one paper?

Practice 1:

The message:

- Hyperglycemia Is Associated with risk of decreased muscle quality in Older Men with Diabetes

Scientific writing

Study designs:

Vali Baigi

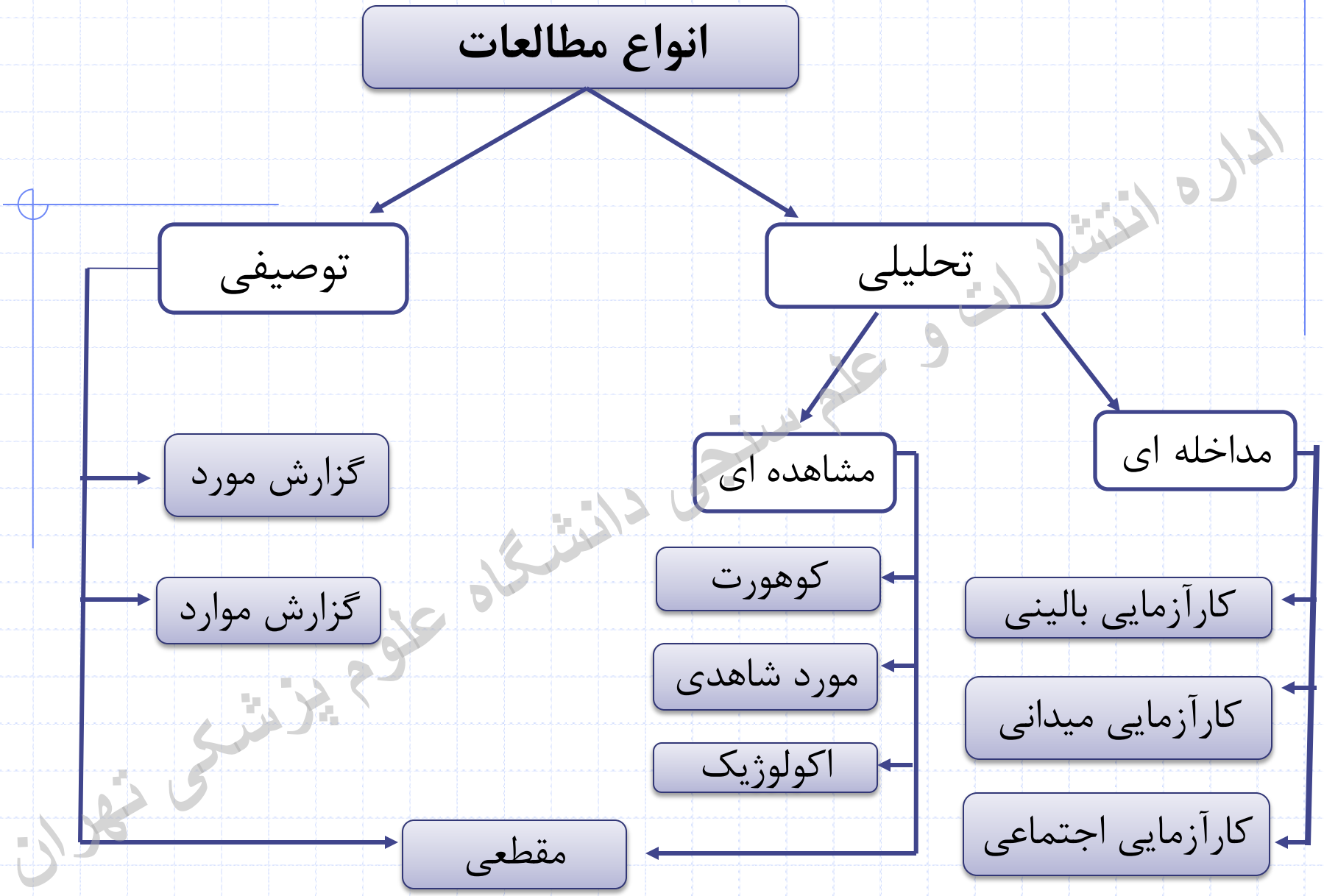
Department of Epidemiology & Biostatistics
School of Public Health
Tehran University of Medical Sciences

Epidemiological Studies Classification

- **Two major Types:**
  - Quantitative
  - Qualitative

Two Types of Studies

- Primary Study
- Secondary Study



Epidemiology

Definition?

تعریف اپیدمیولوژی:

John M Last:

"The study of the distribution and determinants of health-related states or events in specified populations, and the application of this study to the control of health problems."

علم بررسی وفور، توزیع و عوامل تعیین کننده حالات مرتبط با سلامتی و حوادث در جوامع و بکار گیری این بررسی برای مبارزه با مشکلات بهداشتی.

اپیدمیولوژی

پاسخ به سوالات...

Who? When ? Where?

Why?

انواع مطالعات

- مطالعه‌های توصیفی
- مطالعه‌هایی هستند که پژوهشگر تنها وضعیت یک متغیر را بررسی کرده یا وضعیت چند متغیر را بدون در نظر گرفتن ارتباط آنها با یکدیگر بررسی می‌کند (شخص، زمان، مکان).
- تعیین بار بیماری، برآورد خدمات و نیروی انسانی
- ایجاد فرضیه (hypothesis generation)
- معمولا روی یک گروه ؟؟

انواع مطالعات

- **مطالعه‌های تحلیلی**
  - مطالعه‌هایی هستند که پژوهشگر به ارتباط بین دو یا چند متغیر پرداخته و هدف تعیین این ارتباط است.
  - روی حداقل دو گروه
  - آزمون فرض (hypothesis testing)

- مطالعات تحلیلی به دو سؤال زیر پاسخ می دهند:
- الف) آیا ارتباط بین علت و معلول وجود دارد؟
- ب) اگر ارتباطی وجود دارد آیا این ارتباط علیتی است؟

مهم ترین انواع مطالعات توصیفی

- گزارش مورد (بیمار) Case Report
- مجموعه موارد Case Series
- مقطعی Cross-sectional

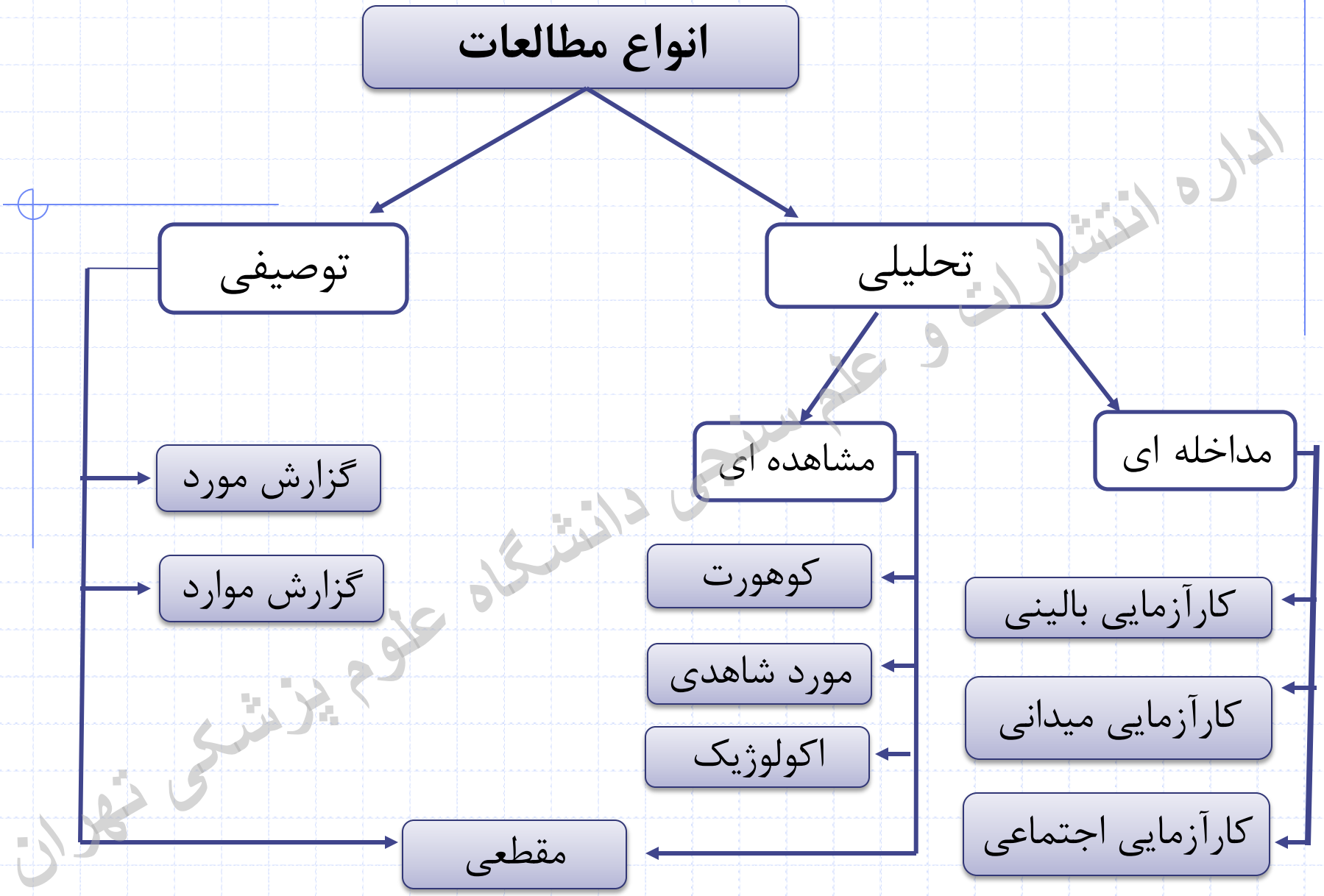
تقسیم‌بندی مطالعه‌های تحلیلی

- **مطالعه‌های مشاهده‌ای**
  - مطالعه‌هایی هستند که در آن پژوهش‌گر هیچ نقشی در وجود و مقدار متغیرهای مستقل و مخدوش‌کننده در بین واحدهای پژوهش ندارد.

- **مطالعه‌های مداخله‌ای**
  - مطالعه‌های هستند که پژوهش‌گر حداقل یک متغیر مستقل (مواجهه) را خود، تعیین می‌کند.

انواع مطالعات تحلیلی

- **مطالعات تحلیلی مشاهده ای**
  - **مقطعی** Cross-sectional
  - **اکولوژیک** Ecological
  - **مطالعه کوهورت** Cohort studies
  - **مطالعه مورد شاهدی** Case-control
- **مطالعات تحلیلی مداخله ای**
  - **مطالعات کارآزمایی بالینی** Clinical Trial
  - **مطالعات تجربی** Experimental studies



مطالعات مقطعی

Cross Sectional Studies

مطالعات مقطعی (Cross-sectional studies)

- این مطالعات معمولا بر روی نمونه‌ای تصادفی از گروه تعریف شده‌ی اصلی انجام می‌گیرد.
- بررسی افراد یک جمعیت (هر فرد فقط یک بار بررسی می شود)
- متداولتر از سایر مطالعات است
- مطالعه مقطعی که به عنوان مطالعه «شیوع» نیز خوانده می شود، معمولاً شامل یک نمونه گیری تصادفی از جمعیت هدف است.
- در مرحله بعد فراوانی بیماری و وضعیت مواجهه های فعلی یا قبلی افراد و سایر متغیرهای مورد علاقه محقق در این نمونه بررسی می شود.

اهمیت نمونه گیری در مطالعات مقطعی

Cross Sectional Studies (contd)

- نمونه گیری بدون اطلاع از وضعیت بیماری یا مواجهه انجام می گیرد.
- نمونه گیری در یک نقطه زمانی خاص انجام می گیرد.
- این مطالعات توانایی تعیین شیوع یک پدیده را در جامعه دارند.

مزایای مطالعات مقطعی

- به عنوان یک مطالعه توصیفی طرح مناسب برای تولید فرضیه

  (معمولاً اولین قدم در بررسی یک موضوع خاص هستند.)

- مناسب برای برآورد پارامترهای مورد نظر در جامعه (کمی و کیفی)
- توانایی به کاربردن برای چندین مواجهه مختلف یا چندین پیامد خاص

محدودیتهای مطالعات مقطعی

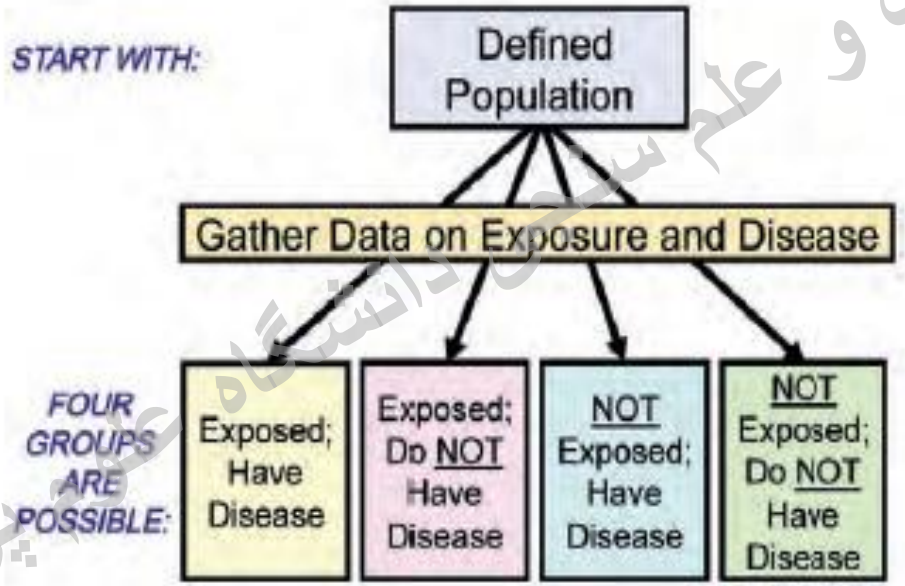
- عدم توانایی اندازه گیری بروز
- پایین بودن **level of evidence**

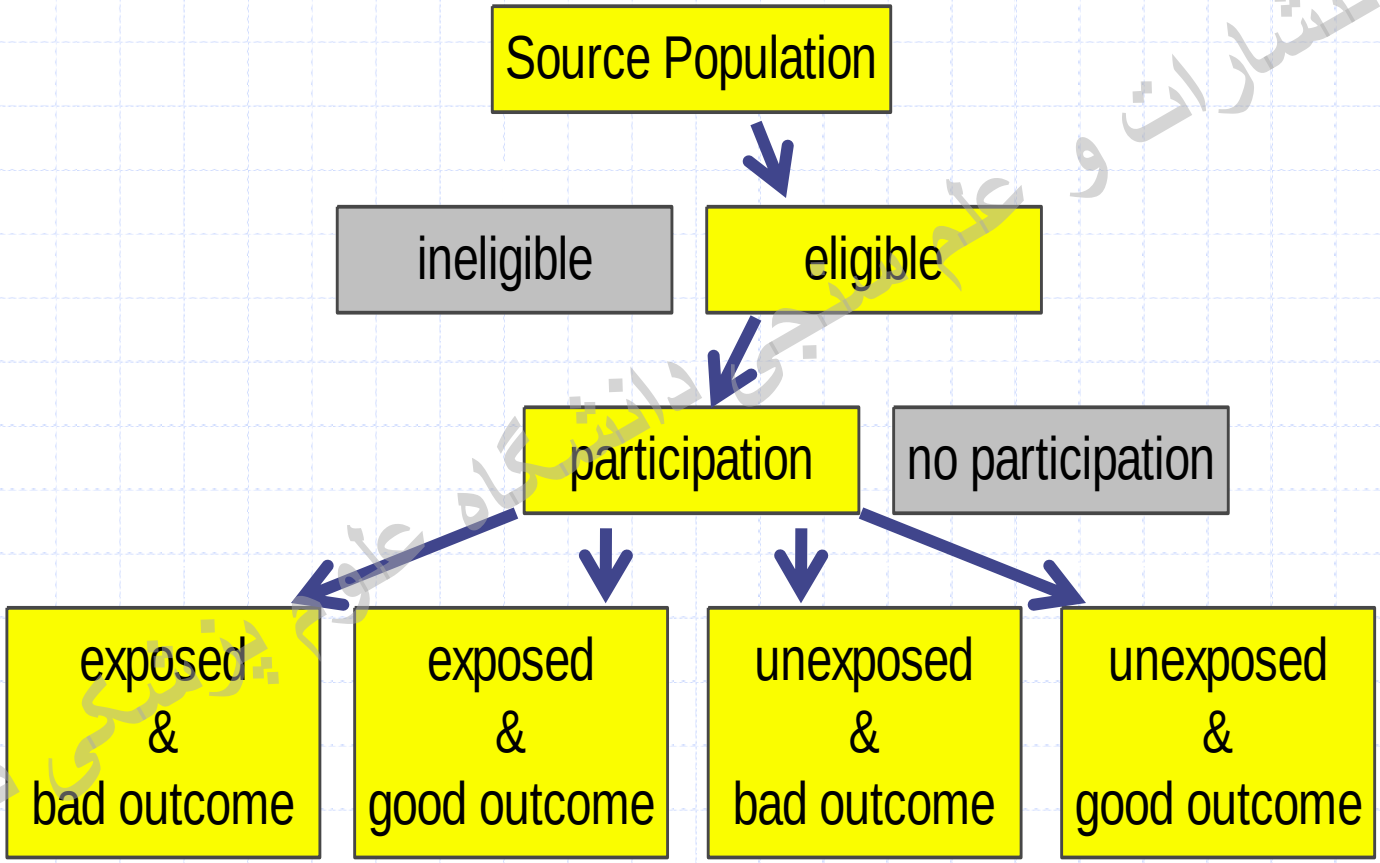
-مخدوش کننده ها

-مشکل تفسیر رابطه زمانی

مشکل تفسیر رابطه زمانی در مطالعات مقطعی

- ✓ رابطه بین سطح کلسترول سرم و بیماری های قلبی عروقی
- ✓ رابطه بین فشار خون بالا و جنسیت



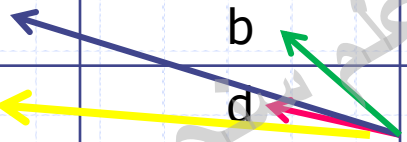


Cross Sectional Studies

هدف: بررسی رابطه سطح اقتصادی- اجتماعی (SES) با افسردگی (Depression) در افراد ۱۸ تا ۲۲ ساله شهر تهران

Cross Sectional Studies

	Disease +	Disease -	Total
exposure	a	b	a + b
Non-exposure	c	d	c + d
Total	a + c	b + d	N



Cross Sectional Studies

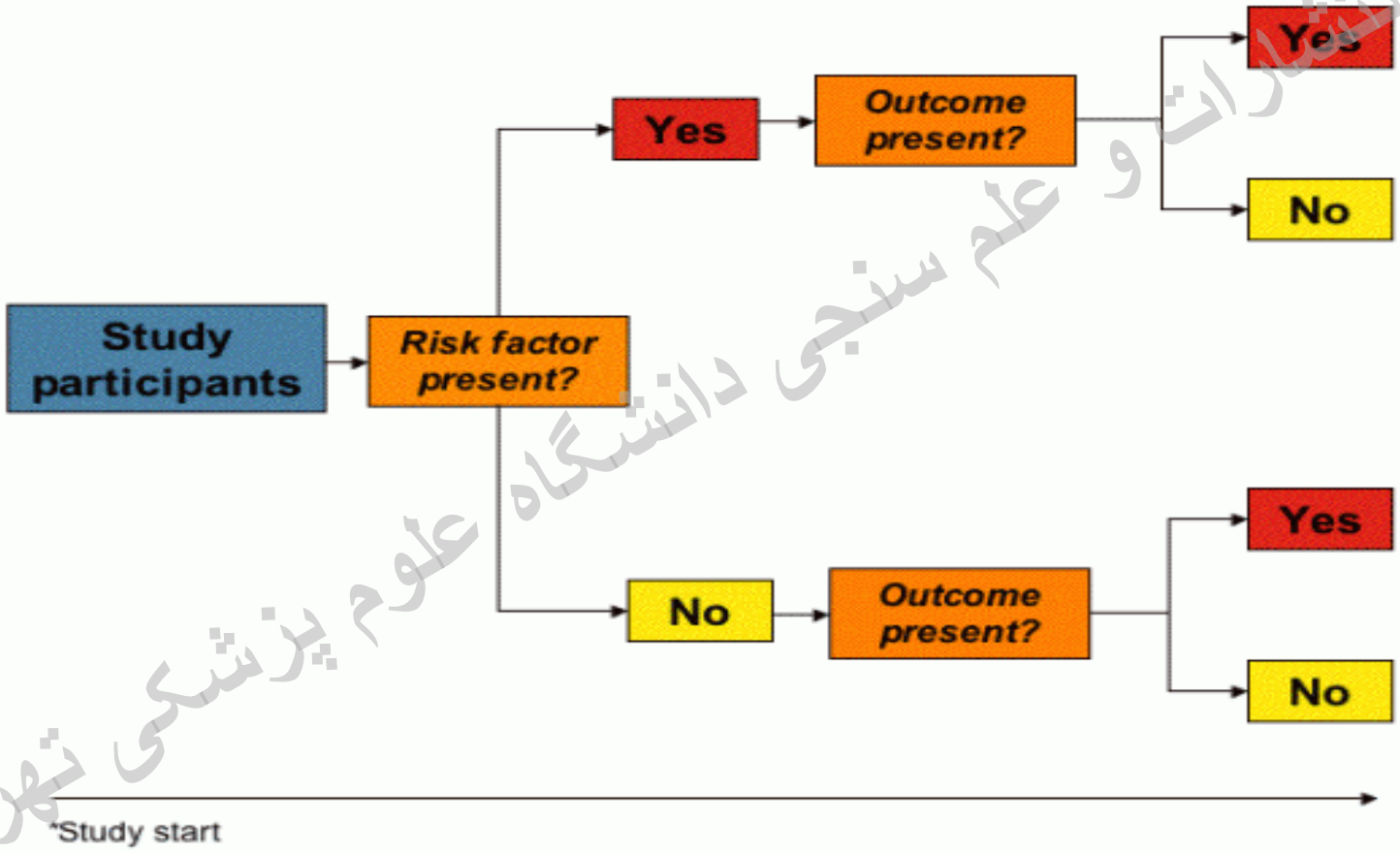
وضعیت اقتصادی اجتماعی	افسردگی: بیمار	افسردگی: سالم	جمع کل
خوب	۳	۸۷	۹۰
بد	۱۴	۷۵	۸۹
جمع کل	۱۷	۱۶۲	۱۷۹

مشخصات مطالعات همگروهی

- هم گروهها (مواجهه‌دار و غیر مواجهه‌دار) قبل از ظهور بیماری مشخص می‌شوند.
- سمت و جهت مطالعه از مواجهه به سوی بیماری می‌باشد.
- گروههای مورد مطالعه را در طی دوره زمانی مشخص از نظر ظهور بیماری پیگیری (Follow)میکنیم.
- اندازه گیری بروز در گروه مواجهه دار و عدم مواجهه

- مناسب تر برای مواجهه های نادر
- هزینه بالا و زمان نسبتا طولانی به دلیل نیاز به پیگیری افراد مطالعه

مطالعات همگروهی



COHORT STUDY

	Disease +	Disease -	Total
exposure	a	b	a + b
Non-exposure	c	d	c + d
Total	a + c	b + d	N

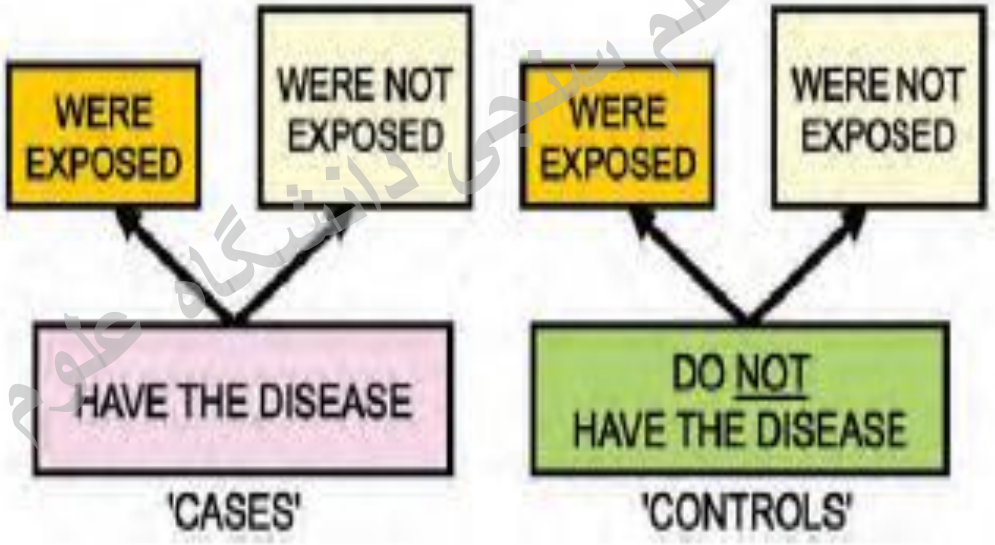
مطالعات مورد شاهدی

- سمت و جهت مطالعه از بیماری به سوی مواجهه می‌باشد.
- از گروه شاهد برای رد یا قبول فرضیه استفاده می‌شود.
- مناسب تر برای بیماری های نادر
- نسبتا ارزان قیمت

مهمترین نقطه ضعف (پاشنه آشیل) مطالعات مورد شاهدی

انتخاب گروه شاهد

مطالعات مورد شاهدی



Case-Control STUDY

	Disease +	Disease -	Total
exposure	a	b	a + b
Non-exposure	c	d	c + d
Total	a + c	b + d	N

Epidemiologic Study Designs

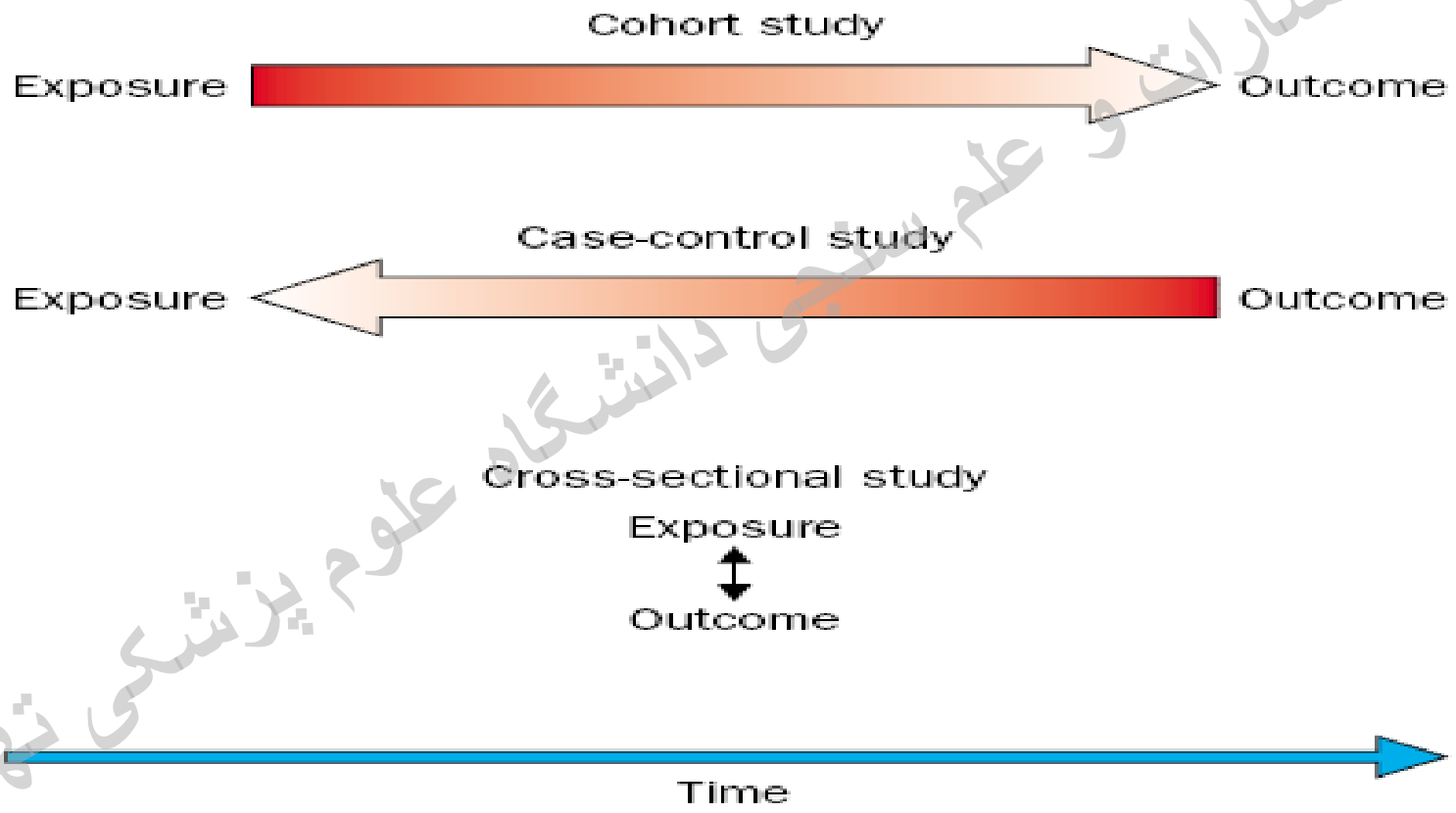


Figure 2: **Schematic diagram showing temporal direction of three study designs**

Grimes & Schulz, 2002 (www)

تفاوت های اصلی بین مطالعات مورد شاهدی و هم گروهی (۱)

مطالعات مورد شاهدی	مطالعات هم گروهی
۱- از معلول به علت می رسد	از علت به معلول می رسد
۲- مناسب تر برای بیماری های نادر	مناسب تر برای مواجهه های نادر
۳-محاسبه شیوع مواجهه در افراد بیمار و افراد بدون آن بیماری	محاسبه بروز بیماری در افراد مواجهه یافته و افراد بدون مواجهه
۵- نیاز به حجم نمونه کم	حجم نمونه بالا
۶- نسبتا ارزان و سریع	نسبتا پرهزینه و وقت گیر
۷- میتوان رابطه چندین مواجهه با یک بیماری (پیامد) را بررسی کرد.	میتوان رابطه چندین پیامد با یک مواجهه را بررسی کرد
۸- معمولاً فقط برآوردی از خطر نسبی را به صورت نسبت شانس به دست می دهد.	خطر نسبی و همچنین خطر قابل انتساب (خطر منتسب) را بطور مستقیم محاسبه می کند.

تعریف کارآزمایی بالینی

Randomized Clinical Trial (RCT)

- کارآزمایی بالینی مطالعه ای است آینده نگر که برای مقایسه اثرات و ارزش یک مداخله (یا مداخله ها) در برابر شاهد در نمونه های انسانی انجام می شود.

هدف کارآزمایی بالینی

- ارزیابی کارایی (efficacy) و اثربخشی (effectiveness) یک مداخله یا داروی جدید

- مداخله: روش درمانی، روش تشخیصی (غربالگری)، روش آموزشی، روش پیشگیری....

انتخاب جمعیت مرجع و جمعیت مورد مطالعه

- جمعیت مرجع یا جامعه هدف (Reference or Target population)
  - جامعه ای که انتظار می رود مداخله مورد نظر در مطالعه تجربی برای آنها منافعی در پی داشته باشد و نتایج مطالعه به آنها تعمیم داده می شود.
    - مثال: بیماران مبتلا به پرفشاری خون خفیف
- جمعیت مورد مطالعه یا مداخله (Study or Experimental population)

تعیین معیارهای انتخاب یا واجد شرایط بودن افراد (eligibility criteria)

- معیارهای ورود (inclusion criteria)
- معیارهای خروج (exclusion criteria)

انتخاب افراد مورد مطالعه (ادامه)

- **معیارهای ورود (inclusion criteria):**
  - مثال: بیماران مراجعه کننده به درمانگاه های داخلی بیمارستان که:

۱- بیمار مبتلا به پرفشاری خون خفیف (براساس تعریف WHO) باشد.

۲- سن فرد ۲۵ تا ۴۹ سال باشد.

۳- بیمار ساکن تهران باشد.

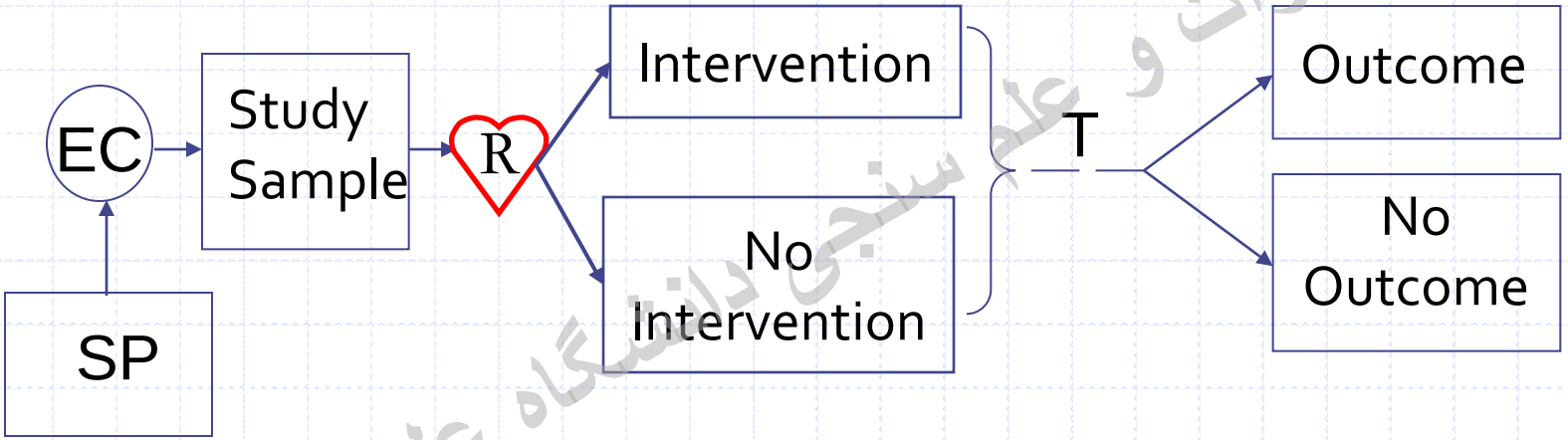
- **معیارهای خروج (exclusion criteria):**
  - مثال: بیماران فوق در صورت داشتن هر یک از خصوصیات زیر از مطالعه خارج می شوند:

۱- بیمار مبتلا به پرفشاری خون ثانویه باشد.

۲- بیمار سیگاری یا دیابتی یا چاق (BMI≥30) باشد.

۳- بیمار دچار بیماری ایسکمیک قلب، نارسایی کلیه یا هرنوع بیماری باشد که در اثر عدم کنترل پرفشاری خون تشدید شود.

طرح کلی کارآزمایی بالینی



SP = Study Population
EC = Eligibility Criteria
R = Randomize intervention
T = Elapsed time

Who gets which treatment?

- To conduct a good experiment, "**treatment assignments**" must be "**random**."

- "**Random**" means everybody has an equal chance of getting a treatment.

Random Selection vs Random Assignment

- Random selection is how you draw the sample of people for your study from a population

- Random assignment is how you assign the sample that you draw to different groups or treatments in your study

Advantages of experiments

- Randomization **should** make the two populations similar, on average, with respect to everything except the treatment.

- So if outcomes are different for the two populations, can conclude that it is the treatment that **caused** it.

Review of what we learnt

Cross Sectional Studies

	Disease +	Disease -	Total
exposure	a	b	a + b
Non-exposure	c	d	c + d
Total	a + c	b + d	N

COHORT STUDY

	Disease +	Disease -	Total
exposure	a	b	a + b
Non-exposure	c	d	c + d
Total	a + c	b + d	N

Case-Control STUDY

	Disease +	Disease -	Total
exposure	a	b	a + b
Non-exposure	c	d	c + d
Total	a + c	b + d	N

Practice 2

kyazdani@tums.ac.ir

V-baigi@razi.tums.ac.ir

How to Write a Paper

Methods & Materials

(Part 1)

Kamran Yazdani, MD MPH PhD

Epidemiologist

Assistant Professor

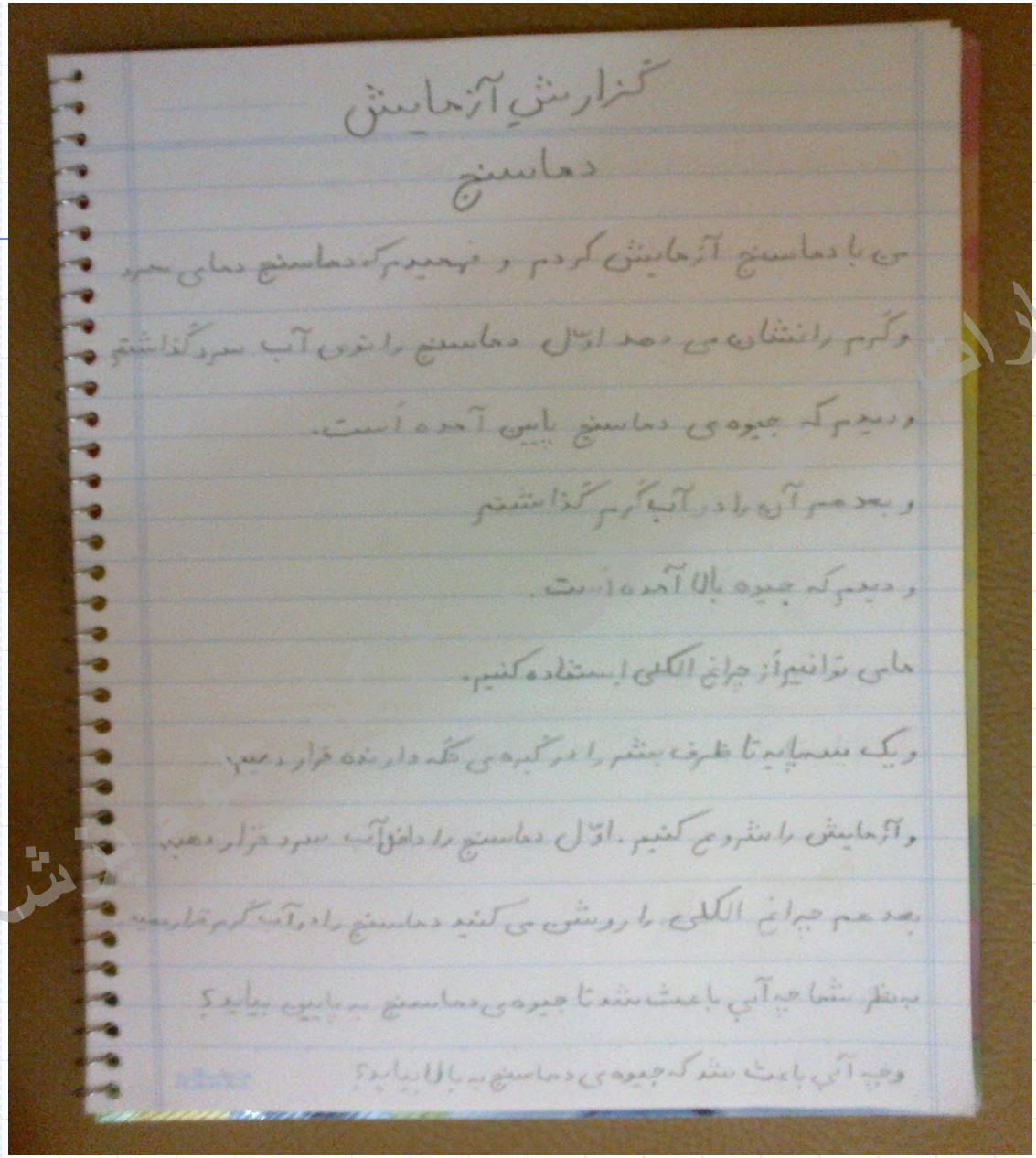
Department of Epidemiology & Biostatistics, School of Public Health

Tehran University of Medical Sciences

Methods

- The purpose of the methods section is to describe how you:
  - reached your objectives
  - obtained your results

- WWWWWH (what, who, where, why, when & how?)


گزارش آزمایش

دماسنج

من با دماسنج آزمایش کردم و فهمیدم که دماسنج دمای سرد

و گرم را نشان می دهد. اول دماسنج را توی آب سرد گذاشتم

و دیدم که جیوه ی دماسنج پایین آمده است.

و بعد من آن را در آب گرم گذاشتم

و دیدم که جیوه بالا آمده است.

ما می توانیم از چراغ الکلی استفاده کنیم.

و یک سطل پر تا ظرف بیشتر را در گیره ی نگه دارنده قرار دهیم.

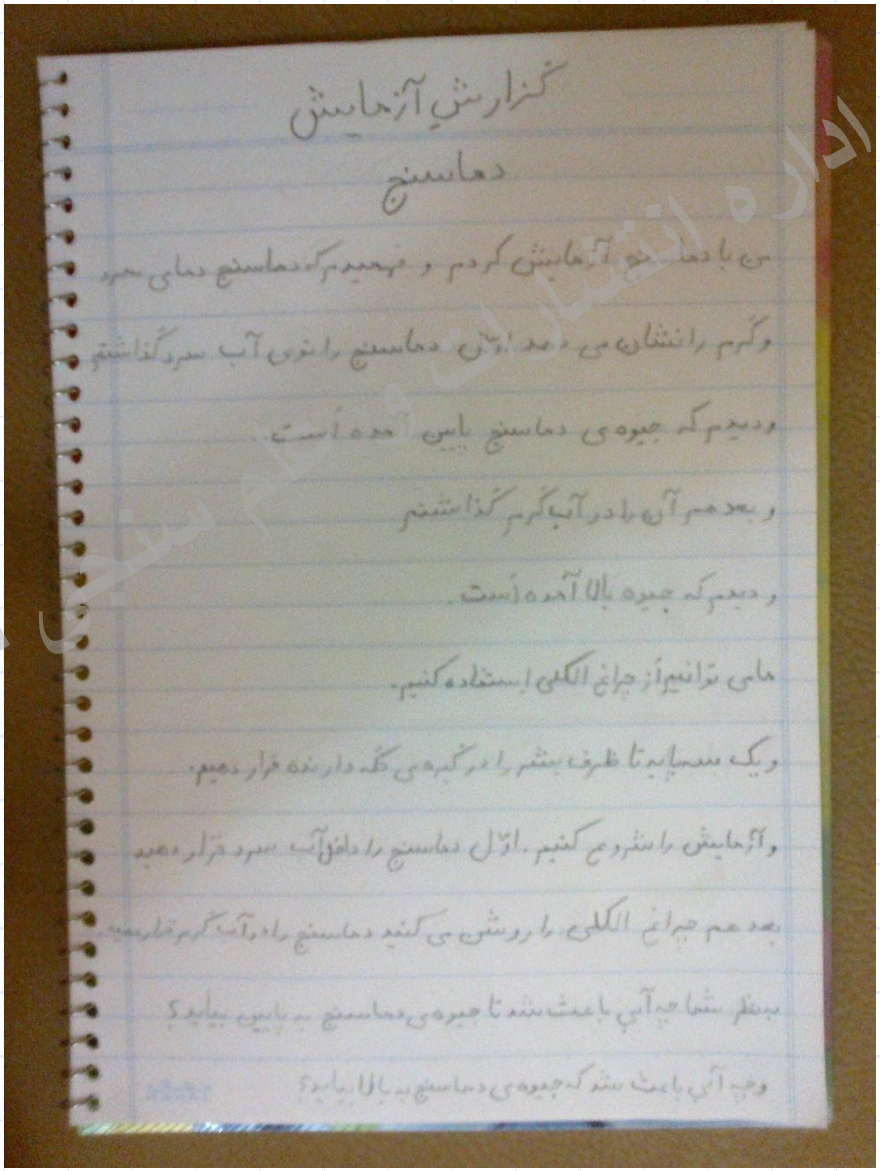
و آزمایش را شروع کنیم. اول دماسنج را داخل آب سرد قرار دهیم.

بعد هم چراغ الکلی را روشن می کنیم دماسنج را در آب گرم قرار دهیم.

به نظر شما چه آبی باعث شد تا جیوه ی دماسنج به پایین بیاید؟

و چه آبی باعث شد که جیوه ی دماسنج به بالا بیاید؟

- Simple
- Transparent
- Repeatable


گزارش آزمایش

دماسنج

من با دماسنج آزمایش کردم و فهمیدم که دماسنج دمای سرد

و گرم را نشان می دهد. اول دماسنج را توی آب سرد گذاشتم

و دیدم که جیوه ی دماسنج پایین آمده است.

و بعد هم آن را در آب گرم گذاشتم

و دیدم که جیوه بالا آمده است.

ما می توانیم از چراغ الکلی استفاده کنیم.

و یک بشر یا ظرف بشر را در گیره ی نگه دارنده قرار دهیم.

و آزمایش را شروع کنیم. اول دماسنج را داخل آب سرد قرار دهید

بعد هم چراغ الکلی را روشن می کنید دماسنج را در آب گرم قرار دهید

به نظر شما چه آبی باعث شد تا جیوه ی دماسنج به پایین بیاید؟

و چه آبی باعث شد که جیوه ی دماسنج به بالا بیاید؟

Methods

- You need to give precise details of:
  - the study design
  - the methods that you used
  - how you analyzed the data
- Define variables
- You should also give some information of where the study was conducted
- In epidemiological paper or a paper concerned with environmental issues, you may need to give some information about the locations of the centers where the data were collected

Methods

Every measurement reported in the results section must have a description of the method used to obtain it

Methods

- The methods section should only be as long as is needed to describe the essential details
- Other researchers:
  - should be able to appraise your work **critically**
  - repeat your study exactly the way that you did it

Methods

- The headings that are used in methods sections, such as:
  - Participants
  - study design
  - specific methods
  - data analysis
  - etc.

Methods (Ethical Approval)

- Investigators should always document both:
  - the approval from the ethics committee
  - informed consent was obtained from each participant

- Many journals now decline to publish results from studies that do not include details of prior ethical approval

Methods (Ethical Approval)

- every paper must contain a statement about the protection of the participants
- the privacy of participants must always be respected
  - Even masking the eyes in a photograph is insufficient
  - written consent for photographs

Methods (Study design)

- The study design should have been clearly identified before the study even began
- Should be **easily** described in the methods section

Methods (Study design)

- It is important to state the design of your study because:
  - each study type has its own strengths and limitations in terms of controlling for bias or confounding
  - Each study design also dictates the type of statistical tests that are appropriate

Methods (Participants)

- how you recruited people
- sampling frame should be clearly described
- inclusion and exclusion criteria in detail

Methods (Participants)

- use accurate and sensitive descriptions of race and ethnicity
- describe the logic behind any groupings that you use
- Common descriptors are:
  - Gender
  - observer-assigned ethnicity
  - country of birth of parents
  - religion
  - self-assigned ethnicity
  - country of birth
  - Years in country of residence

Methods (Participants)

- sample size and sample characteristics??

- This information is probably better placed at the beginning of the Results section

Methods (Sample size)

- The size of your study sample is of paramount importance for:
  - testing your hypothesis
  - fulfilling the study aims
- The number of participants should be large enough to Provide:
  - precise estimates of effect
  - reliable answer to the research question

Methods (Sample size)

- Is it always important to include details of your sample size calculations?

Methods (Sample size)

- It is not always important to include details of your sample size calculations
- When the sample size is small
  - the results are rarely believable
  - the summary estimates lack precision
  - standard statistical methods may be inappropriate
  - generalizability of the results will be questionable

Methods (Questionnaires)

- you should give precise details of the questionnaires you used
- how they were:
  - Developed
  - Validated
  - Tested for repeatability
- The mode of administration:
  - self-administered
  - telephone-administered
  - interviewer-administered

Methods (Questionnaires)

- A valid questionnaire that is thoughtfully designed minimises:
  - measurement bias
  - the amount of missing or unusable information
- If your questionnaire has been ALREADY validated, always give a reference to the work

Practice 3

How to Write a Paper

Methods & Materials
part 2

Kamran Yazdani, MD MPH PhD
Epidemiologist

Assistant Professor
Department of Epidemiology & Biostatistics, School of Public Health
Tehran University of Medical Sciences

Methods (Interventions)

- In experimental studies, exact details of:
  - the interventions
  - how they were administered
  - the intervention of interest
  - the intervention, sham, or placebo that was used for comparison
- You must also describe:
  - the methods of randomisation
  - allocation concealment
  - blinding of the research staff and the participants

Methods (Interventions)

- Allocation concealment: A technique used to prevent selection bias by concealing the allocation sequence from those assigning participants to intervention groups, until the moment of assignment. Allocation concealment prevents researchers from (unconsciously or otherwise) influencing which participants are assigned to a given intervention group.

Methods (Interventions)

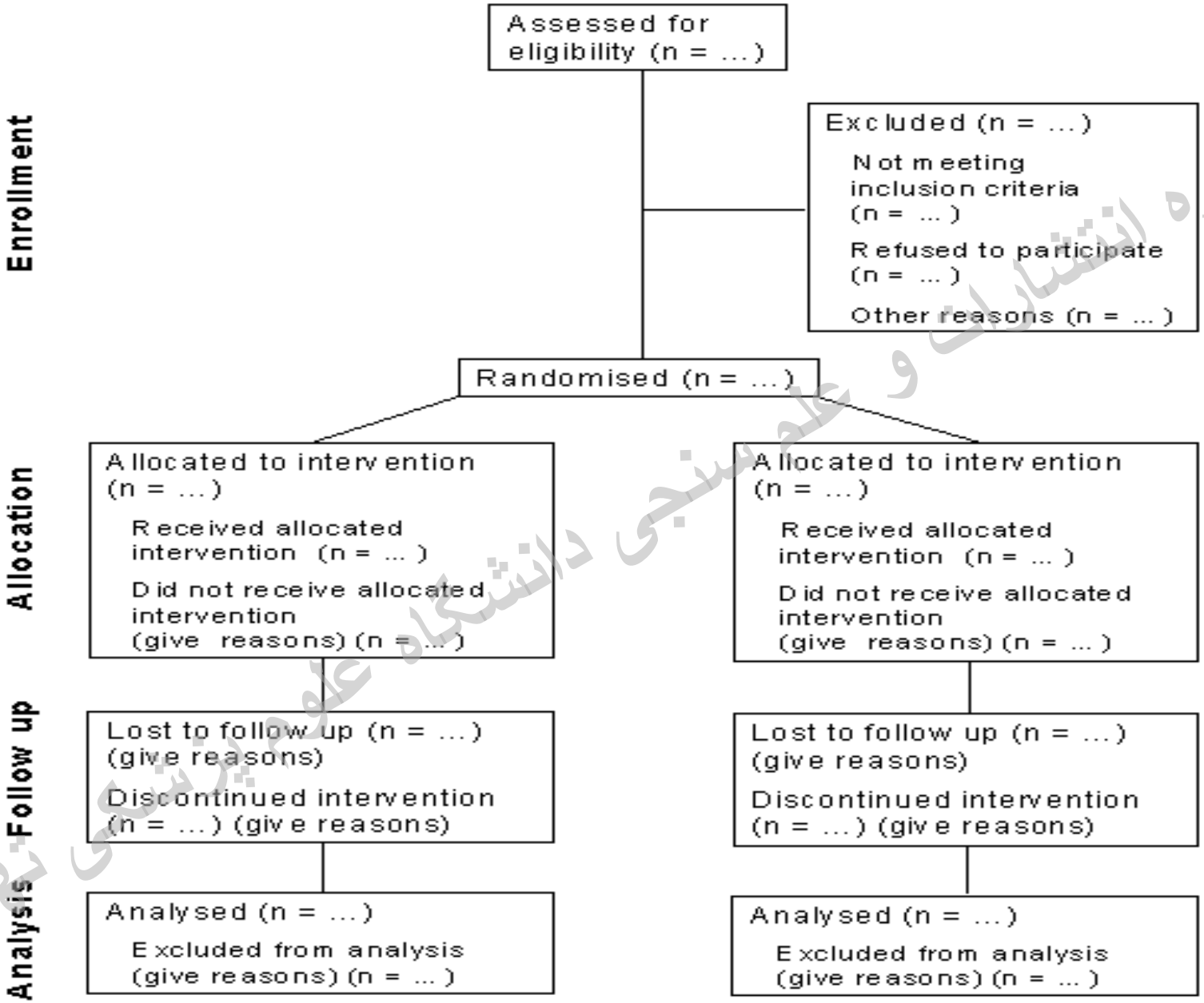
- You must also describe any procedures that you used to maximise or measure compliance with the interventions
- If a drug is being tested:
  - the generic name
  - the manufacturer
  - the doses used
  - any other information

Methods (Interventions)

- 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.

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



Clinical Trial Registry

- Clinicaltrials.gov
- IRCT.ir
- …

Methods (Clinical assessments)

- explain in detail the methods that you used to collect clinical information
- well known equipment can be described with a simple brand name and supplier
- rare or newly devised equipment will need to be described in more detail
- Only ever give a reference to a previous journal article to describe a method if the article describes the method in a comprehensive way

Methods (Clinical assessments)

- It is sometimes a good idea to say why a particular method or piece of equipment was used and what advantages it had over other similar or more commonly used methods
- if more than one observer or piece of equipment was used:
  - the degree of comparability between items of equipment and between observers
- is a critical issue in reducing bias

Methods (Statistical methods)

- describe how you analysed the data with specific details of:
  - the statistical tests
  - the statistical computer packages
- give the critical value of *P* value:
  - $P < 0{\cdot}05$
  - $P < 0{\cdot}01$
  - $P < 0{\cdot}1$

Methods (Statistical methods)

- Results can vary if the outcome or exposure variables are analysed as:
  - continuous
  - non-parametric
  - categorical data
- serious bias can arise if the incorrect statistical test is used
- Use statistical tests proportional to methods you used

Methods (Statistical methods)

- If you used a statistical test that is not simple or well known
  - a reference to the method
  - an explanation of why you used it

- Explain all of the analyses that you used proportional to results section

Practice 4

How to write results

Vali Baigi

Department of Epidemiology & Biostatistics
School of Public Health
Tehran University of Medical Sciences

Results

Simple → complex

- Describe the population
- Start with positive findings in each section
- 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
  - 9±4, 854 (12.3)
- Bring the P values

Results

- Provide only enough interpretation to lead the reader from one experiment to the other
- No need to follow chronology of study
  - Rather, provide a logical progression and tell a story

Active or passive?

The passive voice will likely dominate here, but use the active voice as much as possible

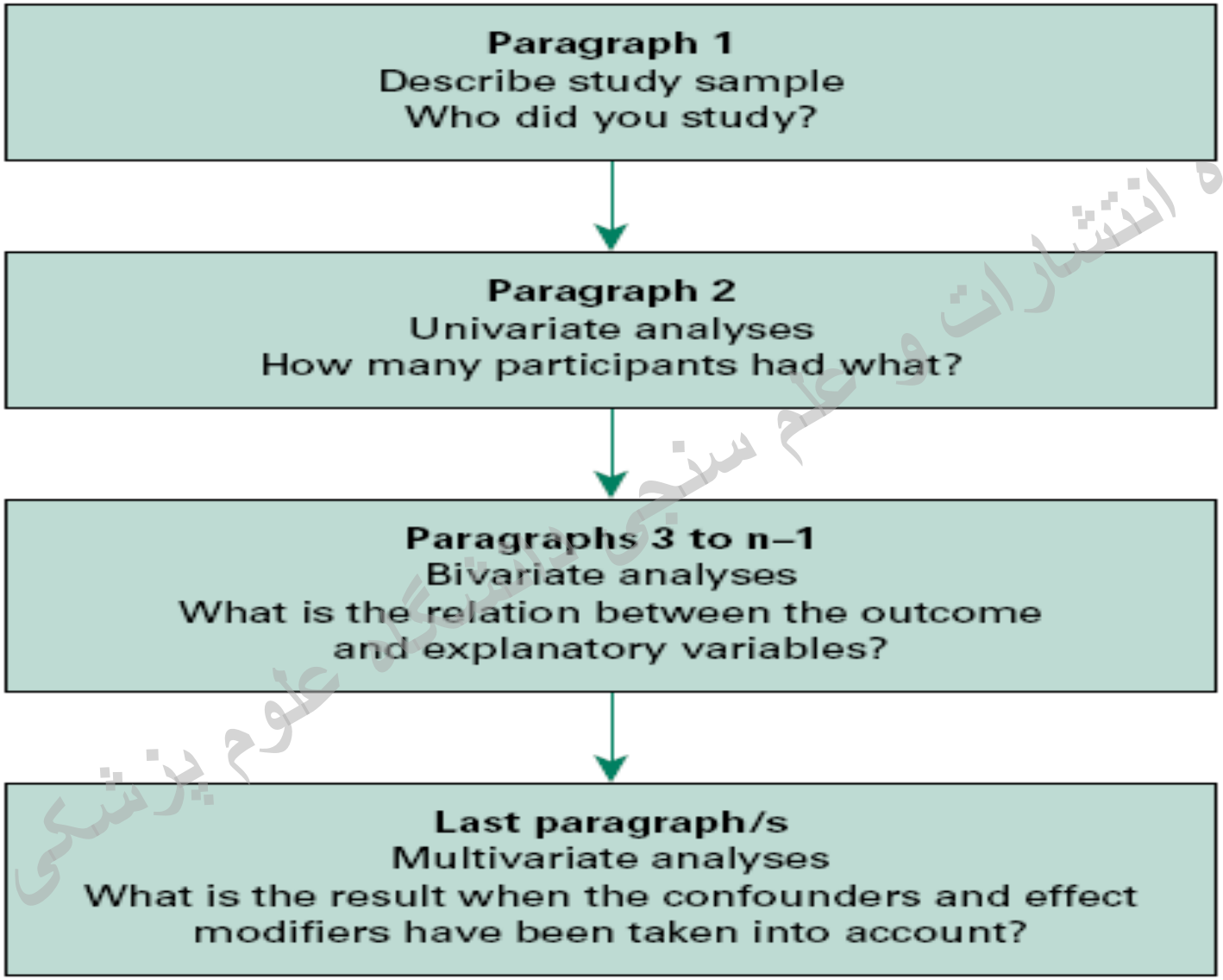


Figure 3.2 Template for the Results.

Table 3.2 Example of topic sentences from the results section of a cross-sectional study.[12]

Notes	Topic sentences
The first paragraphs describe who the participants were.	A total of 1527 participants aged 18 to 73 years from two rural regions participated in this study. Table 1 shows the anthropometric characteristics of the participants ... and Figure 1 illustrates the selection criteria for our normal group. Table 2 shows that the "normal" group of participants were not significantly different from the remainder of the sample in terms of age, height, and weight ($P > 0{\cdot}05$).
The next paragraph describes the bivariate analyses.	The data for the normal group were used to obtain regression equations for FVC, FEV_1 ... with weight, age, gender, and height as the main predictors.
The next paragraphs describe how the bivariate analyses were used.	Using our prediction equations, we calculated mean percentage of predicted FEV_1 values for the whole sample (Figure 2). We then examined the factors that affect lung function.
The final paragraph describes the multivariate analyses.	Multiple regression showed that airway inflammation and asthma were significantly related to reductions in FEV_1 and that the interaction between airway inflammation and recent symptoms was also significant ($P < 0{\cdot}05$).

Note 1:

- 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 ..

Note 2:

- Don't compare your results with results from other studies.
- So where?

Data analysis

Up to 2300 cars an hour use each lane of the M4 while figures show that Victoria Rd is flooded with more than 93,000 vehicles a day.

Daily Telegraph (18 April 2001)

Data analysis

- Be consistent in the use of units in your reporting.
- readers can make valid comparisons between and within groups.

Baseline characteristics

- To describe the baseline characteristics of the participants in any type of study, **always use a table and never use a figure**.
- **comparability** of the study groups
- unevenly distributed confounders may cause an important bias.
- **Generalisability** of your results.

Baseline characteristics (cont')

- Never call the baseline characteristics the "demographics" of your study sample.

- *Oxford Dictionary:*
- ***Demography*** is the branch of anthropology in which the statistics of births, deaths, and diseases are studied.

Baseline characteristics (cont')

- Depend on the type of your variables use:
  - number and percentage
  - the mean and its standard deviation
  - the median and its inter-quartile range

No SE,

No 95% CI

Table 3.3 Example of reporting baseline characteristics.

Clinical characteristics of patients randomised to usual care or nurse intervention. Values are numbers (percentages) unless stated otherwise[2]

	Usual care (n = 81)	Nurse intervention (n = 84)
Mean (SD) age (years)	75·6 (7·9)	74·4 (8·6)
Male	44 (51)	54 (64)
Living alone	38 (47)	37 (44)
Social services required	28 (35)	28 (33)
Other medical problems		
angina	40 (49)	38 (45)
past myocardial infarction	41 (51)	46 (55)
diabetes mellitus	15 (19)	15 (18)
chronic lung disease	18 (22)	23 (27)
hypertension	42 (52)	36 (43)
atrial fibrillation	24 (30)	29 (35)
valve disease	12 (15)	15 (18)
past admission for chronic heart failure	36 (44)	27 (32)
New York Heart Association class at admission		
II	16 (20)	19 (23)
III	33 (42)	28 (34)
IV	30 (38)	36 (43)
Degree of left ventricular systolic dysfunction		
mild	10 (13)	18 (22)
moderate	42 (53)	31 (38)
severe	28 (35)	32 (40)
Renal function at admission		
median (interquartile range) plasma urea (mmol/l)	9·7 (6·5–13·9)	8·1 (6·0–10·3)
median (interquartile range) plasma cotinine (μmol/l)	116 (90–168)	108 (84–132)
Mean (SD) blood pressure (mmHg)		
systolic	126·1 (21·4)	116 (19·5)
diastolic	70·1 (12·0)	68·4 (10·2)

Interpretation of results

- Always try to present your results in an **objective** and **dispassionate** way.
- Never overinterpret your findings.
- limit yourself to describing exactly what you found.

Interpretation of results (cont')

- **For example** do not say,

There was an extremely high incidence of disease in the study population.

- This is **emotive** and **subjective** statement.

- Do not labour your results by **repeating** figures or *P* values in the text that you have **already** listed in a table.

- However you will need to **include the *P value*** *in* the **abstract**.

GOLDEN RULES FOR REPORTING NUMBERS

Table 3.4 Golden rules for reporting numbers.

Rule	Correct expression
Numbers less than 10 are words.	In the study group, eight participants underwent the intervention.
Numbers 10 or more are numbers.	There were 120 participants in the study.
Words not numbers begin a sentence.	Twenty per cent of participants had diabetes.
Be consistent in lists of numbers.	In the sample, 15 boys and 4 girls had diabetes.
Numbers less than 1 begin with a zero.	The *P* value was 0·013.
Do not use a space between a number and its per cent sign.	In total, 35% of participants had diabetes.
Use one space between a number and its unit.	The mean height of the group was 170 cm.
Report percentages to only one decimal place if the sample size is larger than 100.	In our sample of 212 children, 10·4% had diabetes.

Table 3.4 Golden rules for reporting numbers.

Rule	Correct expression
Do not use decimal places if the sample size is less than 100.	In our sample of 44 children, 10% had diabetes.
Do not use percentages if the sample size is less than 20.	In our sample of 18 children, two had diabetes.
Do not imply greater precision than your measurement instrument.	Only use one decimal place more than the basic unit of measurement when reporting statistics (means, medians, standard deviations, 95% confidence interval, interquartile ranges, etc.)
For ranges use "to" or a comma but not "–" to avoid confusion with a minus sign and use the same number of decimal places as the summary statistic.	The mean height was 162 cm (95% CI 156 to 168). The mean height was 162 cm (95% CI 156, 168). The median value was 0·5 mm (interquartile range −0·08 to 0·7). The range of heights was 145 to 170 cm.
Rules for data numbers do not apply to citations to the literature.	The page range was 145–70.

Tables

- Consider using a table to present large amounts of data/results.
- Must refer to all tables in text.
- Use the "Stand alone" tables.
- Tables should not be too large.
- Make sure totals add to 100%
- Table legends go above the Table;
- Why?

Tables are read from top to bottom.

Tables

- keep tables as simple and uncluttered as possible.
- Row and column headings should be brief but sufficiently explanatory.
- Standard abbreviations of units of measurements should be added in parentheses.
- Before you create a table, it is a good idea to review the tables in the journal to which you will submit your paper

Tables (cont')

- Fancy borders, shading, and multiple grids are both distracting and unnecessary.

- In the majority of journals, scientific tables have few horizontal rules and no vertical rules.

Table 4. Population variation in hatch success (mean percent) of unfertilized eggs for females from populations sampled in1997. 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.

<--Table legend

<--Column titles

<--Table body (data)

<--footnotes

<--Lines demarcating the different parts of the table

Table 2 Comparison of subcutaneous adiposity and fat distribution variables among four ethnic groups by sex (adjusted mean ± standard error)

	Chinese	Lebanese	Malays	Thais	Bonferroni comparisons
Boys					
Waist circumference (cm)※	66.7 ± 0.3§	64.1 ± 0.4	62.6 ± 0.3§	65.9 ± 0.4	$P < 0.001$ C = T > L > M
Skinfold					
Biceps (mm)#	7.9 ± 0.2	9.1 ± 0.3§	9.5 ± 0.2	6.6 ± 0.3	$P < 0.001$ C = L = M > T
Triceps (mm)#	15.5 ± 0.3	11.9 ± 0.4	13.0 ± 0.3	12.3 ± 0.4§	$P < 0.001$ C > L = M = T
Subscapular (mm)#	12.1 ± 0.4	11.4 ± 0.5	12.7 ± 0.4	-	$P = 0.115$
Supraspinale (mm)#	15.1 ± 0.4	9.4 ± 0.5	12.1 ± 0.4	12.0 ± 0.5	$P < 0.001$, C > M = T > L
Medial calf (mm)#	-	14.1 ± 0.4	11.8 ± 0.3	10.1 ± 0.4§	$P < 0.001$, L > M >T
Trunk (mm) #	28.0 ± 0.7	21.6 ± 0.9	25.6 ± 0.8	-	$P < 0.001$, C = M > L
Trunk/upper extremity ratio #	1.15 ± 0.02	0.92 ± 0.03	0.99 ± 0.02	-	$P < 0.001$, C > M > L
Supraspinale/upper extremity ratio #	0.62 ± 0.01	0.42 ± 0.02§	0.48 ± 0.0§	0.60 ± 0.02	$P < 0.001$, C = T > M > L
Subscapular/supraspinale ratio†	0.88 ± 0.03	1.17 ± 0.04§	1.09 ± 0.04§	-	$P < 0.001$, C < L = M
Girls					
Waist circumference (cm)※	63.4 ± 0.3	61.9 ± 0.3	59.7 ± 0.3	64.0 ± 0.3	$P < 0.001$, C = T > L > M
Skinfold					
Biceps (mm)#	7.7 ± 0.2	8.2 ± 0.2	9.7 ± 0.2	6.7 ± 0.2	$P < 0.001$, M > L > C = T
Triceps (mm)#	15.2 ± 0.3	11.7 ± 0.3	13.1 ± 0.3	13.2 ± 0.3	$P < 0.001$, C > M = T > L
Subscapular (mm)#	11.4 ± 0.3	9.8 ± 0.3	11.3 ± 0.3	-	$P = 0.003$, C = M > L
Supraspinale (mm)#	14.9 ± 0.4	10.0 ± 0.4	12.6 ± 0.4	13.1 ± 0.4	P <0.001, C > M = T > L
Medial calf (mm)#	-	14.5 ± 0.4	13.5 ± 0.3	11.9 ± 0.3	$P = 0.009$, L > M = T
Trunk (mm) #	26.2 ± 0.6	19.7 ± 0.7	23.9 ± 0.6	-	$P < 0.001$,C > M > L
Trunk/upper extremity ratio #	1.13 ± 0.02	0.94 ± 0.02	0.99 ± 0.02	-	$P < 0.001$,C > L = M
Supraspinale/upper extremity ratio #	0.63 ± 0.01	0.47 ± 0.01	0.52 ± 0.01	0.64 ± 0.01	$P < 0.001$, C = T > M > L
Subscapular/supraspinale ratio†	0.84 ± 0.02	1.06 ± 0.03	0.98 ± 0.03	-	$P < 0.001$, L = M > C

§ Significant difference in adjusted mean value between boys and girls within each ethnic group using ANCOVA with Bonferroni multiple comparisons procedure

※ Adjusted for BMI and age

Adjusted for body fat mass and age

† Adjusted for trunk fat

C: Chinese; L: Lebanese; M: Malays; T: Thais

Table 3.5 Example of a scientific table.

Multivariate logistic regression for incident self-reported symptoms of anxiety or depression at year 9. Values are numbers (percentages) unless otherwise stated[24]

	Incident symptoms of anxiety or depression at year 9 (n = 116)	Total (n = 1746)	Adjusted odds ratio (95% CI)	*P* value
Victimised at baseline				
not bullied in year 8	28 (24·1)	680 (38·9)	1·00	
bullied at one time in year 8	42 (36·2)	575 (32·9)	1·49 (0·88 to 2·54)	0·130
bullied at both times in year 8	46 (39·7)	491 (28·1)	2·03 (1·14 to 3·64)	0·019
Availability of attachments at baseline				
available at both times in year 8	96 (82·8)	1501 (86·0)	1·00	
available at one time in year 8	17 (14·1)	217 (12·4)	1·25 (0·53 to 2·96)	0·594
no available attachments in year 8	3 (2·6)	25 (1·4)	1·97 (0·43 to 9·05)	0·366
Arguments with others at baseline				
none at baseline	31 (26·7)	837 (47·9)	1·00	
with one other at either time	67 (57·8)	798 (45·7)	1·86 (1·05 to 3·30)	0·036
with two or more others at either time	18 (15·5)	104 (6·0)	4·25 (1·82 to 9·94)	0·002
Sex				
male	40 (34·5)	868 (49·7)	1·00	
female	76 (65·5)	878 (50·3)	1·86 (1·02 to 3·40)	0·044
Family structure				
intact family	86 (74·1)	1422 (81·4)	1·00	
separated, divorced, other	30 (25·9)	324 (18·6)	1·47 (0·9 to 2·4)	0·116

Example of Table

Three horizontal lines

Table 1. Descriptive characteristics of the study groups, means ± SD or N (%).

Characteristic	Bad Witches	Good Witches
N	13	12
Age (yrs)	45 ± 5	36 ± 6*
Female	11 (85%)	10 (83%)
BMI (kg/m^2)	21 ± 6	23 ± 3
Systolic BP (mmHg)	140 ± 10	120 ± 9*
Exercise (min/day)	30 ± 20	60 ± 30*
Employment status		
Unemployed	4 (31%)	0 (0%)
Part time	3 (23%)	4 (33%)
Full time	6 (46%)	8 (66%)
Smoker (yes/no)	6 (50%)	0 (0%)*

*p<.05, ttest or Fisher's exact test, as appropriate.

Tables formats..

- Follow journal guidelines recommendation:
  - Roman or Arabic numbers (I, II or 1,2)
  - Centered or flush left table number, title, column heading, data
  - Capital letters and italics
  - The placement of footnotes
  - The types of footnote symbol (*, #...etc)

Tables (cont')

- **groups** are represented by **columns**
- **outcome variables** are shown in **rows.**
- Don't put **sample or group sizes** at the base of a table.
- Tables should be submitted on separate pages.

What not to do During writing table !(1)

Do not use all lines of table

Remove grid lines

Table 1. Descriptive characteristics of the study groups, means ± SD or N (%).

Characteristic	Bad Witches	Good Witches
N	13	12
Age (yrs)	45 ± 5	36 ± 6*
Female	11 (85%)	10 (83%)
BMI (kg/m^2)	21 ± 6	23 ± 3
Systolic BP (mmHg)	140 ± 10	120 ± 9*
Exercise (min/day)	30 ± 20	60 ± 30*
Employment status		
Unemployed	4 (31%)	0 (0%)
Part time	3 (23%)	4 (33%)
Full time	6 (46%)	8 (66%)
Smoker (yes/no)	6 (50%)	0 (0%)*

*p<.05, ttest or Fisher's exact test, as appropriate.

What not to do!(2)

Table 1. Descriptive characteristics of the study groups, means ± SD or N (%).

Characteristic	Bad Witches	Good Witches
N	13	12
age (yrs)	45 ± 5	36 ± 6*
female		(83%)
BMI (kg/m^2)		23 ± 3
Systolic BP (mmHg)		0 ± 9*
Exercise (min/day)		± 30*
Employment status		
Unemployed	4 (31%)	0 (0%)
Part time	3 (23%)	4 (33%)
Full time	6 (46%)	8 (66%)
Smoker (yes/no)	6 (50%)	0 (0%)*

*p<.05, ttest or Fisher's exact test, as appropriate.

Make sure everything lines up and looks professional

What not to do!(3)

Do not Use a long decimal number

Table 1. Descriptive characteristics of the study groups, means ± SD or N (%).

Characteristic	Bad Witches	Good Witches
N	13	12
Age (yrs)	45.076 ± 5.032	36.007 ± 6.032*
Female	11 (85%)	10 (83%)
BMI (kg/m^2)	21.223 ± 6.332	23.331 ± 3.333
Systolic BP (mmHg)	140.23 ± 10.23	120.23 ± 9.23*
Exercise (min/day)	30.244 ± 20.345	60.123 ± 30.32*
Employment status		
Unemployed	4 (31%)	0 (0%)
Part time	3 (23%)	4 (33%)
Full time	6 (46%)	8 (66%)
Smoker (yes/no)	6 (50%)	0 (0%)*

*p<.05, ttest or Fisher's exact test, as appropriate.

What not to do. (4)

Give units!

Do not miss variables' unit

Table 1. Descriptive characteristics of the study groups, means ± SD or N (%).

Characteristic	Bad Witches	Good Witches
N	13	12
age	45 ± 5	36 ± 6*
female	11 (85%)	10 (83%)
BMI	21 ± 6	23 ± 3
Systolic BP	140 ± 10	120 ± 9*
Exercise	30 ± 20	60 ± 30*
Employment status		
Unemployed	4 (31%)	0 (0%)
Part time	3 (23%)	4 (33%)
Full time	6 (46%)	8 (66%)
Smoking	6 (50%)	0 (0%)*

*p<.05, ttest or Fisher's exact test, as appropriate.

Figures and graphics

- Figures are used when we want to distinguish a result & make it prominent into readers view

- Use figures to graphically represent *significant* results.
- Figure legends go below the figure;
- Why?

figures are usually viewed from bottom to top

Figures and graphics

- The figure should be totally self-explanatory and stand-alone
- the detail has to be balanced against simplicity.

Remember….

- you are not with your figure to present it.
- However, figures with too much detail become complicated and difficult to understand.

Figures

- Avoid clutter(too many numbers &symbols)
- Should provide a clear statistical message
- Vertical (“Y”) axis: outcome/dependent variable
- Horizontal (“X”) axis: exposure/independent variable
- Name & define each axis
- Give the measurement unit of each axis

Figures and graphics (cont')

- Consider their publication in black and white.
- Figures should be simple to interpret, uncluttered, and free of extra lines, text, dimensions, and other tricks.
- third dimension has no meaning when presenting scientific results

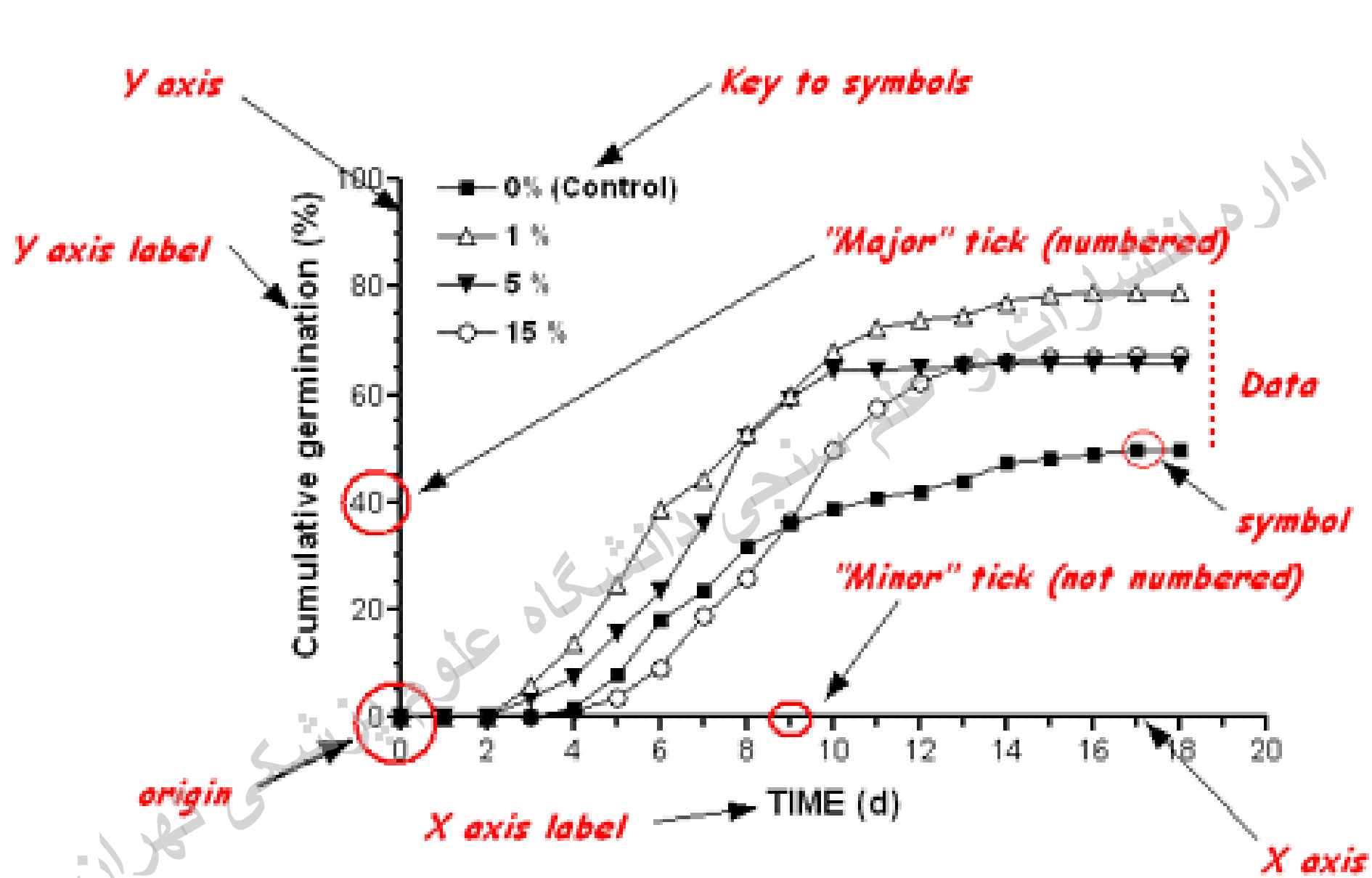


Figure 1. Cumulative germination of *Chenopodium* seeds after pregermination treatment of 2 day soak in NaCl solutions. n = 1 trial per treatment group (100 seeds/trial.)

legend

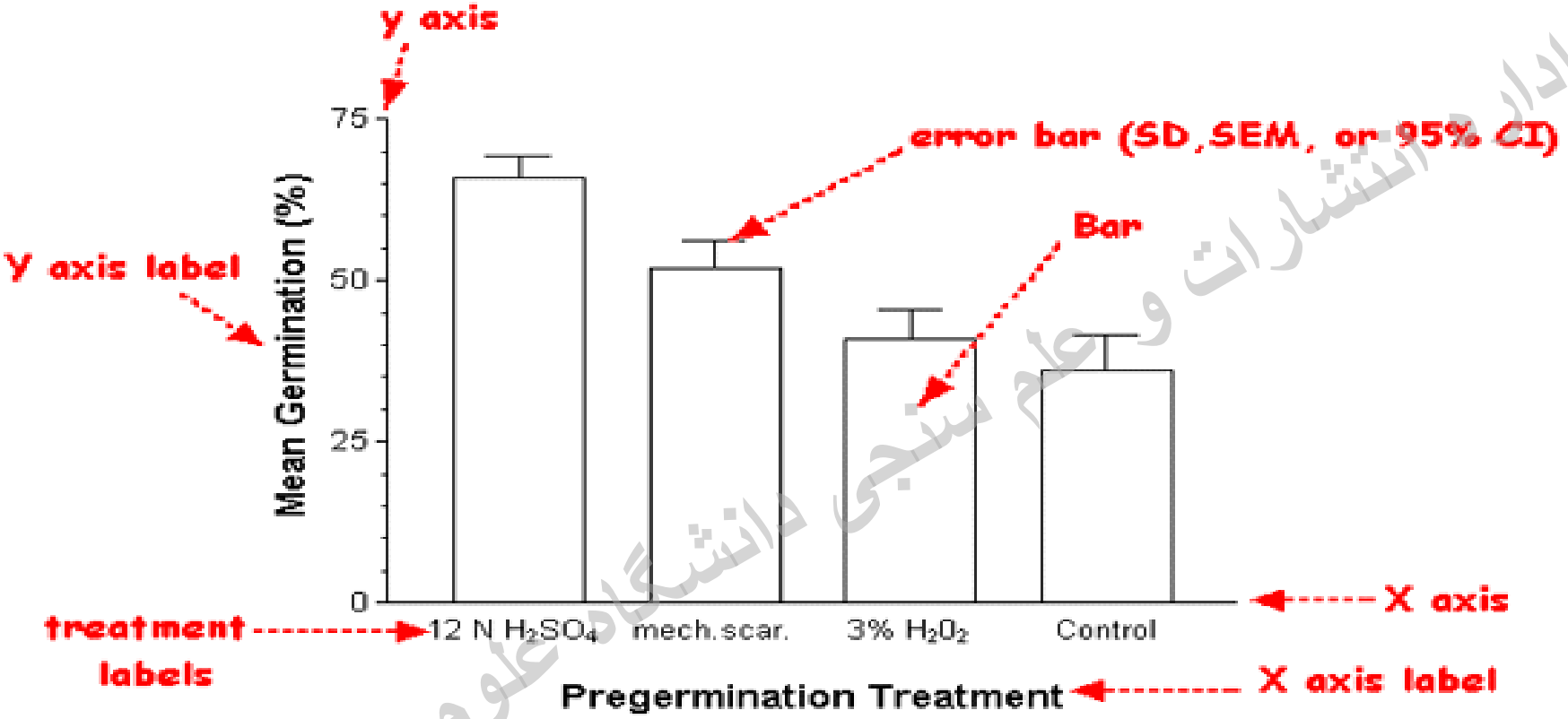


Figure 1. Mean germination (%) of gourd seeds following various pregermination treatments. N=10 groups of 100 seeds per treatment and control. Treatments: 12 hour soak in 12 N H_2SO_4, 90 second scarification of seed coat with 80 grit sandpaper, 6 hour soak in 3% H_2O_2.

figure legend

Figure: *Before*

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

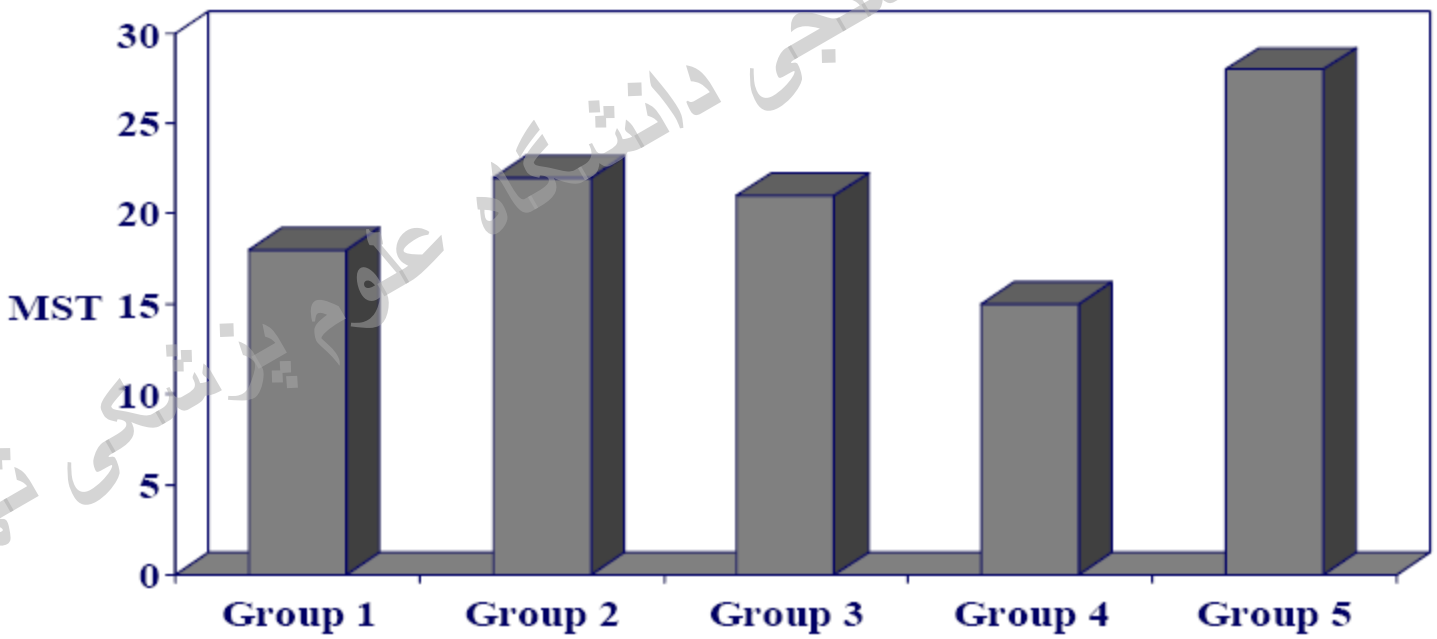


Figure: *After*

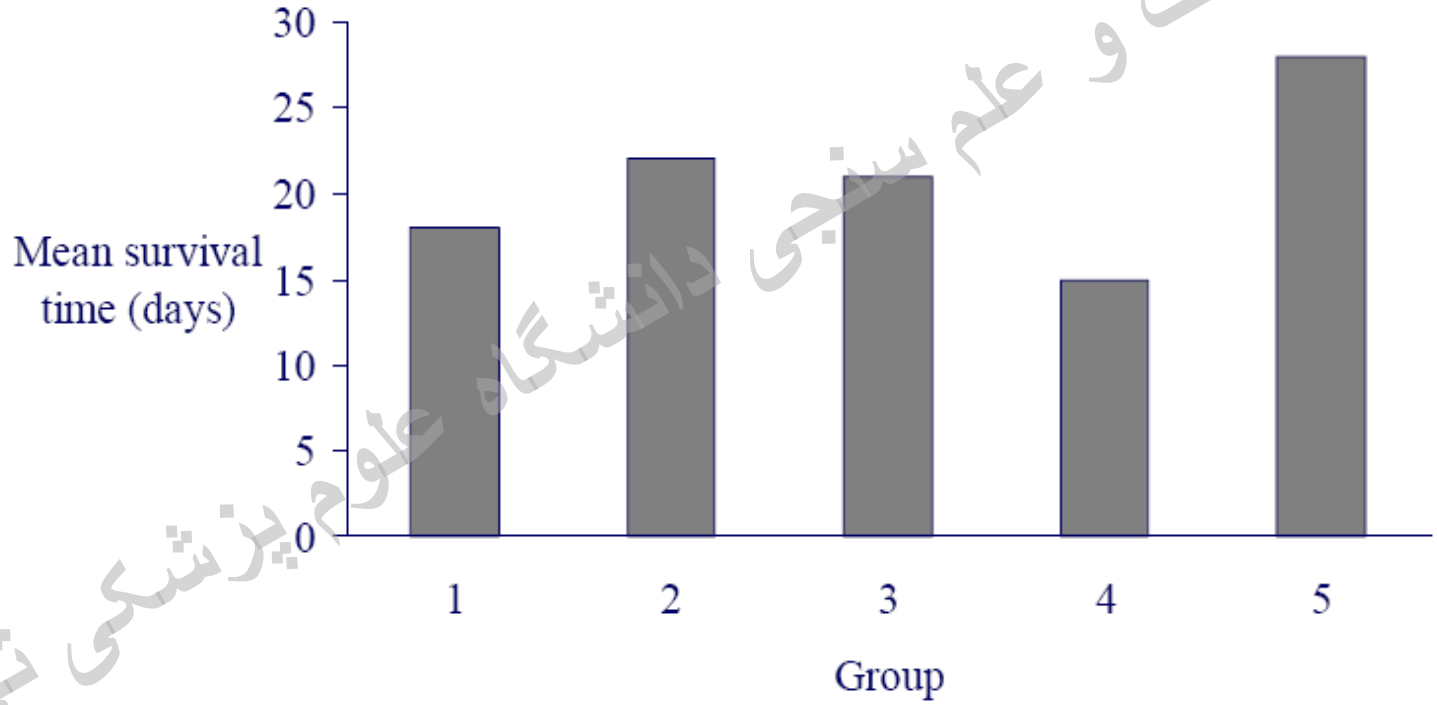


Figure 1. Effect of total alkaloid fraction of methanolic extract of unripe fruit of Solanum pseudocapsicum on mean survival time (MST) in tumor bearing mice.

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.
- 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.

Illustrations

- Purpose-specific
- Graphs
  - Line: usually event in relation to time
  - Bar: comparisons
  - Pie: parts of a whole
  - Histogram: frequency distribution
  - Scatter: associations between variables

Illustrations

- Photographs, pictures
  - Technique
  - Before and after
  - Show an event
- Flow charts
  - Process, sequence, systems
  - Algorithms

Results:

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

Do NOT !

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

Recommend

- Look at recent issue of journal
- Use a similar published figure as a template

- Read journal instructions
- Read Vancouver style (*www.icmje.org*)

Practice 5

How to Write a Paper

Results: statistics

Kamran Yazdani, MD MPH PhD

Assistant Professor of Epidemiology

Department of Epidemiology & Biostatistics, School of Public Health

Tehran University of Medical Sciences

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
  - through the processes of dividing your data into outcome or explanatory variables
  - 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 always important to use the abbreviation SD, SE, or CI to define which statistic you are presenting and to avoid using an ambiguous ± 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 $SD = \sqrt{variance}$ $Variance = \Sigma (x_i - x)^2/n - 1$
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

Spread

Standard deviation (SD)	95% of the measurements lie within two standard deviations above and below the mean $SD = \sqrt{variance}$ $Variance = \Sigma (x_i - x)^2/n - 1$
Range	Highest value – Lowest value Calculate by ranking measurements in order
Interquartile range	Range of 25th to 75th percentiles Calculate by ranking measurements in order

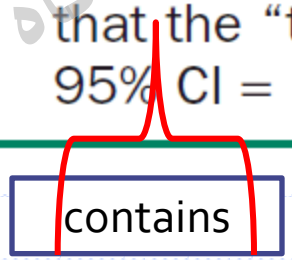
Results: statistics

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% CI = mean ± (SE × 1·96)

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% CI = mean ± (SE × 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

- Many journals try to keep *P* values to a minimum
- reserve *P* values and significance testing for only what you absolutely need to test
- This will exclude the significance testing of baseline characteristics in randomised controlled trials

Results: statistics

- The question of whether you should test hypotheses that were not formed prior to undertaking the study is contentious

- One golden rule is never to test a hypothesis that does not have biological plausibility
  - However, new ideas emerge all the time

Results: statistics

Multivariate analyses

- should never be undertaken until all the univariate and bivariate analyses are evaluated, understood, and tabulated
- you first need to measure the relation of each exposure to the outcome independently, and the relation between the two exposures.
  - contingency tables are ideal for this.

Results: statistics

- It is also important that these complex analyses have some degree of transparency to the reader

- If you are presenting the results of a one-way or two-way analysis of variance, the mean values and standard deviations in each of the groups or the adjusted mean values should be presented, in addition to the regression equation or the analysis of variance statistics

Results: statistics

- Always include adequate summary and subgroup statistics
- This transparency allows the reader to judge the magnitude of the differences between groups and to make comparisons with other studies
- It is never helpful to report the results of complex mathematical procedures that cannot be back-translated into an effect size

Results: statistics

In summary

Be Simple and Transparent as much as possible!!

Practice 6

How to Write a paper

Introduction Section

Vali Baigi

Department of Epidemiology & Biostatistics
School of Public Health
Tehran University of Medical Sciences

Introduction

- ✓ Background/Rationale
- ✓ Leads the reader to the research question and present that question
- ✓ Prepares the reader for the rest of the article

Template for the Introduction

Paragraph 1:

What we know

Paragraph 2:

What we don't know

Paragraph 3:

Why we did this study

What is Known & What is Unknown

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
- About 3 to 4 paragraphs

Introduction

1. Existing state of knowledge
2. Gaps in knowledge which research will fill.
3. Give relevant references
4. Summarize the rationale for study or observation
5. Define specialized terms or abbreviations you want to use
6. State what you Intend to do & the purpose of article

Objectives

- State objectives or any pre-specified hypotheses.
- **Example**

- We aimed to estimate …
- Our objective was determine…
- Our purpose was specify …

Inverted pyramid

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
- **Focus on message**

Use tenses correctly in the Introduction

- **What is known**

  in present simple tense

  Malaria **is** still the number one killer of all the infectious diseases.

  Most deaths…..

- **Past studies and their results**

  in past tense

  Schmidt et al. (1993) **showed ….**

Use tenses correctly in the Introduction (cont')

- **The research aim or purpose**

  in past tense

  - The purpose of this study **was** to answer the following question.

- **The research question**

  in present tense

  - What retrospective meteorological factors **correlate….**

Practice 7

How to Write a Paper

Discussion

Kamran Yazdani, MD MPH PhD
Assistant Professor of Epidemiology

Department of Epidemiology & Biostatistics, School of Public Health
Tehran University of Medical Sciences

Discussion

- By now you have answered three questions:
  - "Why did we do it?" (Introduction)
  - "What did we do?" (Methods)
  - "What did we find?" (Results)
- It is now time to put all of this into context by dealing with a fourth question:

"So what?"

Discussion

- *Say what your findings mean, not what you would like them to mean or think they ought to mean.*

JS Lilleyman

Discussion

- The section should reiterate your main findings

BUT

- in the context of:
  - furthering knowledge
  - impacting on patient care
  - public health policy
  - or future research.

Discussion

- This is the time:
  - to be honest about any limitations of your study,
  - to explain how your findings fit in with established knowledge,
  - and to explain any inconsistencies

Discussion

- can be the most daunting section
- If you have a broad knowledge of the literature and of the various opinions in your research field, it can be hard to limit yourself only to the parts that are particularly relevant to your paper
- make notes as you analyse your results and read the literature.

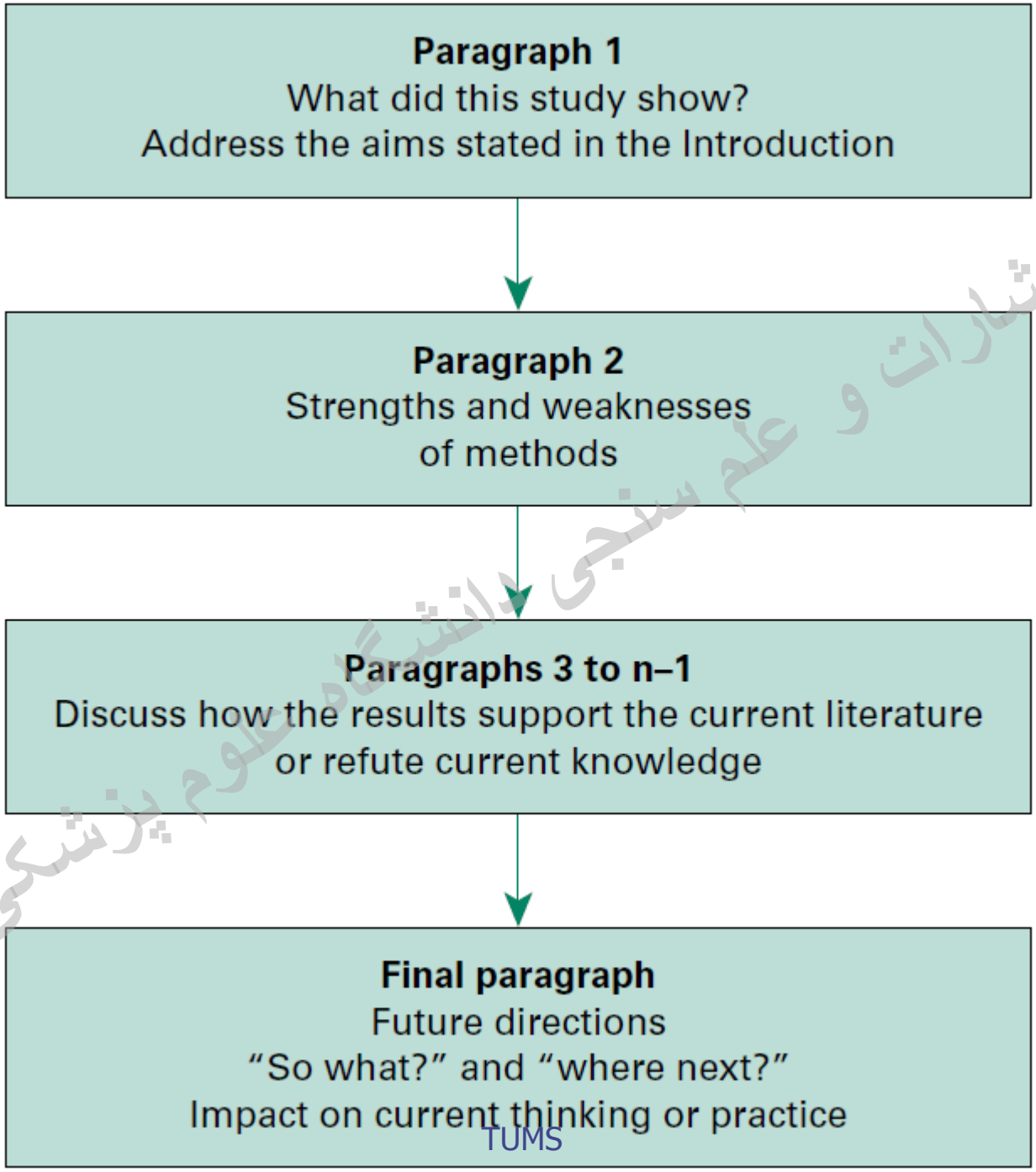
Discussion

- Jotting down the major ideas that you will need to discuss as they come to mind will help you to organise your discussion section

- make notes about which literature supports your findings and which is at odds with your results as you progress

Discussion

- These concept ideas often translate into topic sentences and help to keep each paragraph in focus
- The paragraphs can then be ordered from the most to the least important topics
- This will help to create a discussion that flows naturally and sensibly



Discussion

Paragraph 1
What did this study show?
Address the aims stated in the Introduction

- brief summary of what you really found and why it was important
- You can restate the aim in more general terms
- but do not be tempted to restate the results exactly as in the results section

Discussion

Paragraph 1
What did this study show?
Address the aims stated in the Introduction

- Good phrases to begin with are:
  - *The results from this study showed that …*
  - *Our results indicate that …*
  - *The purpose of this study was to …*
  - *We found that …*
- should focus on the **BIG PICTURE** of what your results are really all about

Discussion

Paragraph 1
What did this study show?
Address the aims stated in the Introduction

- Be bold
- Explain precisely what you have found
- Explain how it will add to current knowledge or change health care.

Discussion

Paragraph 2
Strengths and weaknesses
of methods

- Honesty is the best policy here
- you do not need to be unnecessarily negative about what you have done
- However, be honest about how chance, bias, or confounding may have influenced your results
  - how you minimised this possibility
    - how your research is better than others'

Discussion

Paragraph 2
Strengths and weaknesses
of methods

- Although many readers like to find this information in the second paragraph

- It can also be placed later in the section.

Discussion

Paragraphs 3 to n–1
Discuss how the results support the current literature or refute current knowledge

- explain how your results agree or disagree with other studies and with other related theories

- Do not be tempted to discuss all the journal articles in every remotely related field

Discussion

Paragraphs 3 to n–1
Discuss how the results support the current literature or refute current knowledge

- confine yourself to discussing the work in your field that is highly relevant and reputable
- If you have reached a different conclusion from other researchers
  - try to explain why you think this has happened

Discussion

Paragraphs 3 to n–1
Discuss how the results support the current literature or refute current knowledge

- Your references to the literature need to be both focused and brief

Discussion

Final paragraph
Future directions
"So what?" and "where next?"
Impact on current thinking or practice

- an exciting summary of the implications of your findings
- The "so what?" of your research needs to be very clear here
- This is a time when you can extend your thinking a little without overstating the implications

Discussion

Final paragraph
Future directions
"So what?" and "where next?"
Impact on current thinking or practice

- it is **IMPORTANT** that:
  - you never generalise your results beyond the bounds of the type of participants included in your study
  - never draw unjustified conclusions

PLEASE

Discussion

Final paragraph
Future directions
"So what?" and "where next?"
Impact on current thinking or practice

- On the other hand
  - Do not be too tentative if you found a strong association between the exposure and outcomes that you were investigating

BE FAIR

Discussion

Final paragraph
Future directions
"So what?" and "where next?"
Impact on current thinking or practice

- Never finish a discussion with
  - *Further studies are needed …*
  - *We are now investigating whether ….*
- This is not only boring but it is presumptuous to tell your readers what research you consider that they should do, or what you are thinking of doing next

Discussion

Final paragraph
Future directions
"So what?" and "where next?"
Impact on current thinking or practice

- By writing a clear "so what?", you create a much more interesting and informative end to a paper
- Some journal editors suggest that discussion sections should not be finished with statements that recommend specific public health actions

Practice 8

kyazdani@tums.ac.ir

How to write a paper:

Abstract

Vali Baigi

Department of Epidemiology & Biostatistics
School of Public Health
Tehran University of Medical Sciences

Title and abstract are

Trailer of the movie

Abstract

- You must pay particular attention
- Your abstract is essential
- should only convey the most interesting and most important parts

It is a miniature of your whole article

Abstract

- first stating the aims of the study
- followed by the basic study design and methods
- followed by the main results including specific data and their statistical significance
- Finally, finish with the conclusion and interpretation

Abstract

- Structured
  - Different patterns
- Unstructured

- Even if the journal does not specify any subheadings, write your abstract as though they were there

Abstract
An Example

Box 3.1 Example of a well-structured abstract

Randomised controlled trial of specialist nurse intervention in heart failure[2]

Objectives To determine whether specialist nurse intervention improves outcome in patients with chronic heart failure.
Design Randomised controlled trial.
Setting Acute medical admissions unit in a teaching hospital.
Participants 165 patients admitted with heart failure due to left ventricular systolic dysfunction. The intervention started before discharge and continued thereafter with home visits for up to 1 year.
Main outcome measures Time to first event analysis of death from all causes or readmission to hospital with worsening heart failure.
Results 31 patients (37%) in the intervention group died or were readmitted with heart failure compared with 45 (53%) in the usual care group (hazard ratio – 0·61, 95% confidence interval 0·33 to 0·96). Compared with usual care, patients in the intervention group had fewer readmissions for any reason (86 versus 114, $P = 0·018$), fewer admissions for any reason (86 *v* 114), fewer admissions for heart failure (19 *v* 45, $P < 0·001$) and spent fewer days in hospital for heart failure (mean 3·43 *v* 7·46 days, $P = 0·0051$).
Conclusions Specially trained nurses can improve the outcome of patients admitted to hospital with heart failure.

Abstract
An Example

Box 3.1 Example of a well-structured abstract

Randomised controlled trial of specialist nurse intervention in heart failure[2]

Objectives To determine whether specialist nurse intervention improves outcome in patients with chronic heart failure.
Design Randomised controlled trial.
Setting Acute medical admissions unit in a teaching hospital.
Participants 165 patients admitted with heart failure due to left ventricular systolic dysfunction. The intervention started before discharge and continued thereafter with home visits for up to 1 year.
Main outcome measures Time to first event analysis of death from all causes or readmission to hospital with worsening heart failure.
Results 31 patients (37%) in the intervention group died or were readmitted with heart failure compared with 45 (53%) in the usual care group (hazard ratio – 0·61, 95% confidence interval 0·33 to 0·96). Compared with usual care, patients in the intervention group had fewer readmissions for any reason (86 versus 114, $P = 0·018$), fewer admissions for any reason (86 *v* 114), fewer admissions for heart failure (19 *v* 45, $P < 0·001$) and spent fewer days in hospital for heart failure (mean 3·43 *v* 7·46 days, $P = 0·0051$).
Conclusions Specially trained nurses can improve the outcome of patients admitted to hospital with heart failure.

- concise and well-structured
- no wasted words or redundant phrases
- The results are supported by data and *P* values
- the interpretation of the findings is clearly stated in the conclusion

Abstract

- Abstracts always benefit from a serious word trim
- It is essential that you adhere to the word limit
- *Science* and *Nature:* 100 words!!
- the usual limit: 250 words
- Even if a larger word count is allowed, limit yourself to 250 words:

  Databases limits
- If you can’t word trim yourself, ask a colleague to do it for you

Information that should be included in your abstract

Do:

- Provide a clear indication of what the reader can expect from your paper.
- List the key methodological details
- Describe the results that directly answer the research question
- Summarise the paper with the take home message of greatest importance.

Do NOT waste space By:

- offer a full – fledged literature review in the introductory statements,
- including minor details like how participants were recruited in the methods,
- including data that are less central to the research question (e.g. **demographic** information and response rates) in the results
- Concluding with statements like ' **More research is needed** '

Abstract Writing

- Use present tense verbs for the background
- Use past tense verbs to state what was done (methods) and what was found (results).
- Use a cautious present tense verb for implications (for example, "may mediate").

focus on only the most critical details

Abstract is like an advertisement

نکته مهم:

نتایج چکیده باید با متن مقاله همخوانی داشته باشد

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 .

How to write a paper:

Title

Vali Baigi

Department of Epidemiology & Biostatistics
School of Public Health
Tehran University of Medical Sciences

Title and abstract

Trailer of the movie

Title

- First & most of the times the only part of an article that readers and editors see and read.
- Key elements that advertises the paper's contents
  - Informative and Specific
- Maybe helpful to choose the title when the paper is complete

Title

- whether or not potential readers find the paper?
- Will they take the time to download and read the full article?
- Each of these factors is a fundamental determinant of the paper's impact.

Characteristics of effective titles

- Short and simple
- Concise and precise
- State subject, not conclusion
- Include study design (no consensus)
- Include time and place if necessary
- Remove empty phrases such as “ A study of…”
- Use Subtitles (notice number of words) “Exercise and Coronary Heart Disease: Framingham Offspring Study”

Characteristics of effective titles (cont')

- identify the main issue of your paper.
- begin with the subject of your paper
- are accurate, unambiguous, specific, and complete.
- do not contain abbreviations.
- accurate
- specific
- informative
- attract readers

warning :

- you must always be accurate and specific in your choice of words and ensure that you do not extend your title beyond the scope of your paper.
- For example, a review entitled

Respiratory health of Australians

- would be expected to contain a broad scope of information:

infections, allergies, smoking outcomes, asthma, and chronic lung disease in both adults and children.

- On the other hand, a title such as

Asthma and atopy in Australian children

- is more specific and may more accurately describe the scope of the review.

Different ways of writing titles

- **Titles that give independent variable, dependent variable, and population (**Classic method **):**

- Effect of asthma on linear growth in children

- Asthma and linear growth in children

  - Classic titles can be boring, especially if they are not short and concise.

Different ways of writing titles (cont')

- **Titles that pose a question:**
  - Does asthma reduce linear growth?
  - Are asthmatic children shorter than non-asthmatic children?
  - + may attract readers who want to know the answer.
  - - they tend to suggest a positive result and are therefore **misleading** if the findings are negative.

Different ways of writing titles (cont')

Titles that give the answer to the question:

(The "assertive sentence title")

- Asthma is negatively associated with growth in height during adolescence
- Linear growth deficit in asthmatic children.

- Whilst these titles work well to attract attention amongst the **poster rows at a conference**, they **should** certainly **not be used** to report study results **in a journal article**.

Titles that give the answer to the question (cont'):

- The "assertive sentence title" has grown in popularity but should be avoided at all costs for journal articles.
- These titles give an answer to the study question and, as such, convey an impression of eternal truth.
- What about possibility of error???
- it remains in the literature forever.

Title:

- try and work towards a title that is
- **short**
- **informative**
- **attractive**
- **and**
- **factually correct**

Practice 9

Thank you

kyazdani@tums.ac.ir

V-baigi@razi.tums.ac.ir