Nutritional epidemiology

- **Nutritional epidemiology deals with nutritional determinants of health and disease in populations.**
- The main goal of nutritional epidemiology is to contribute to the prevention of diseases and improve the health of the population in cooperation with medical fields, information, planning and legislative spheres.
- Nutritional epidemiology monitors food consumption, nutrient intake and nutritional status of populations of all age groups from intrauterine development to old age.

Types of studies and interpretation of results

Descriptive study

Sorts information on dietary factor exposure and disease in the population. Finds out who was exposed, when, where. It gives rise to a **basic hypothesis** about a possible connection between a dietary factor and the disease.

🔎 *For more information see Descriptive studies, Methodology in epidemiology.*

Analytical studies

In order to test **the underlying hypothesis**, it measures the strength of the association between a dietary factor and a disease, or determines the most severe dietary factor from a set. Ecological, incidence and case-control studies are mainly used in nutritional epidemiology.

🔎 *For more information see Analytical studies.*

Ecological studies

They use data from entire population groups. They cannot be applied to individuals. Those who regularly add salt to their food are twice as likely to develop hypertension within 10 years than those who do not add salt.

Case study

Subjects are exposed to different levels of dietary factors at baseline or during the study. They are investigating newly developed diseases that appeared during the study in exposed individuals.

- They belong to **prospective studies**, because they follow the natural course of time.
- The probability of developing a disease in persons exposed to a given level of a dietary factor is measured.
- The measure of the association between a dietary factor and a disease is the **relative risk (RR)**, which expresses *which expresses how many times the probability of the disease is higher in those persons who are exposed to* the dietary factor than in those, *who are not exposed.*

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- Differential risk (DR) is the difference in relative risks (RR). With proven causation, it can be interpreted as an **attributive risk**. If the risk factor were eliminated from the population, the incidence of the disease would decrease by the given difference (DR).

A case-control study

- They use cases (diseased) and controls (healthy) after exposure to a dietary factor.
- They belong to **retrospective studies**, because they examine the past.
- The measure of the association between the dietary factor and the disease is the **odds ratio (OR)** which expresses the ratio of two scores (the ratio of the number of people exposed to the dietary factor and those not exposed). For a given exposure factor, the OR proportion expresses the score **of cases** and **controls**.

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- When the disease is rare in the population, the OR is numerically very similar to the RR. With increasing disease frequency in the population, the OR values rise steeper than the RR.

Intervention studies

They verify the causal effect of the dietary factors identified by the **analytical study**. They consist in the random (randomized) selection of study participants into groups without or with nutritional intervention. We are monitoring the occurrence of new cases during the course of the study. If the association rates **RR and OR are equal to 1**

and **DR has a value of 0%**, the dietary factor is most likely not involved in the pathogenesis and therefore no dietary intervention is needed. If an intervention leads to a significant reduction in disease incidence, the dietary factor is most likely causal and dietary interventions are warranted.

Measurement of exposure to dietary factors

It has different forms.

- We can inquire about **one-day dietary intake**, but this may not reflect usual intake.
- **A prospective personal menu** for a period of 3 to 7 days (including the weekend) records all food and drink consumption. It carries the risk of underestimating the amount of income and is burdensome.
- **Diet history** requires a good memory and insight into your dietary intake in terms of type and quantity. People who cook at home have a much more accurate view.
- **The frequency questionnaire** determines how many times a week or month a given food is consumed. It is used with large groups of interviewees. It belongs to retrospective, anamnestic methods that can underestimate energy intake.
- **An interview conducted by a trained worker** is a more holistic anamnestic method.
- The investigation of **biomarkers** of the food consumed is complementary, it helps to correct the conclusions of the analyses. Most of the biomarkers reflect more immediate food intake, they can draw attention to the presence of toxic substances in dietary intake.
  - Measurement of habitual energy intake using doubly labeled water composed of deuterium ^{2}H and oxygen ^{18}O. The metabolic turnover of labeled water in saliva, urine and exhaled air in the form of CO_2. can be calculated . Energy expenditure at a stable body weight corresponds to dietary energy intake.
  - The estimation of dietary protein intake is aided by the measurement of nitrogen in the urine.
  - Dietary fat composition can be measured in cell membranes over several weeks.
  - Phytoestrogens and their metabolites draw attention to soy in the diet.
  - Blueberry is manifested by isothiocyanates.

Confounding factors, randomization

- We must consider confounding factors when analyzing the data. If they are ignored, they can distort the interpretation of statistical outputs. Confounding factors may be related to a dietary factor or disease. An example is the failure to identify smokers and thus the effect of *smoking* on the disease under investigation. Other confounding factors are *age, gender, abuse, socioeconomic status.*
- **Randomization** is necessary to limit the influence of confounding factors. It will ensure an even distribution of confounding factors into the intervention and control (placebo) groups, so they will not artificially bias the measured association between the dietary factor and the disease.

An observational study with Mendelian randomization

They are created by dividing the researched selection according to genotype, they examine the effect of *functional gene polymorphisms* on the occurrence of the disease. Different gene variants ensure an even distribution of misbehaving factors.

- In a common **observational study**, *functional gene polymorphisms* (a DNA variant with a population frequency higher than 1%) are used, which produce changes in the organism equivalent to those observed with *high or low food intake*. For example, a gene variant that produces a less functional enzyme leads to an increase in the level of the metabolite in the organism with an unchanged substrate intake and is thus equivalent to a high intake of the substrate in the diet.
- According to Mendel's 2nd law, parental alleles are passed on to offspring randomly if they are not genetically linked. Confounding factors also behave in a similarly **randomized manner**.

Links

Related Articles

References

- KUDLOVÁ, Eva et al.. *Hygiena výživy a nutriční epidemiologie.* 1. edition. 2009. ISBN 978-80-246-1735-0.