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SOME PRINCIPLES AND ASPECTS OF HEMATOLOGY

Makhmudova Barno Shamsuddinovna
Faculty of Pediatrics, Department of Neonatology, Senior teacher
ASMI.

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Abstract:

The article substantiates a new expanded interpretation of the concept of "population hematology". The latter is not only a hematological section of traditional population and epidemiological medicine. Its main object is the population of patients, but its uniqueness lies in the fact that its basic object is a hierarchy of nested populations: blood cells, cell clones and groups of people. The most important property in the studied samples is their heterogeneity and, moreover, the change in heterogeneity over time.

Keywords: population hematology, populations, epidemiology, heterogeneity, cohorts, evidence-based medicine, biostatistics, clinical research.

INTRODUCTION

There are two approaches in the philosophy of science: typological and population. The first is characteristic of exact natural sciences, the second - for population and social sciences, such as demography, sociology, economics, etc. In the typological approach, deviations of real objects from ideal, model ones are considered as measurement errors and are not taken into account, in the population, it is variations and deviations that serve as the subject of study [1].

Heterogeneity is a key concept in population sciences [2].

It is interesting that the biological science of cells is faced with the need to operate with the concept of "heterogeneity" when analyzing the dynamics of cell populations [3].

MATERIALS AND METHODS

Medical practice and clinical guidelines are based on reverse extrapolation - from the "ideal" average object to the "ideal" (phantom) group or population. The simplistic bureaucratic tendency is to treat this homogeneous population of patients, obtained on the basis of the analysis of some "average" patient. As a result of two extrapolation options (from a real group of different objects to the ideal average and from the average back to the real group), the errors and errors made during their implementation are summed up and reinforce each other. Errors of the first stage are those caused by selection, non-representativeness of the sample on which the model of the "ideal" patient is built. Errors of the second stage, i.e. errors of backward extrapolation, occur as a result of neglecting the heterogeneity of the population that is supposed to be influenced.

RESULTS AND DISCUSSION

Human populations

The most important objects of research and impact of population hematology are people, their groups and populations. The purpose of the study is group factors that unite these populations, factors that determine heterogeneity, internal and external mechanisms of influence and interaction, procedures for forming groups, their selection for assessing, for example, morbidity, mortality, etc.

Cell populations

Biological media and their samples in hematological patients are the main source of information about the disease and somatic status of the patient. Blood is, first of all, a set of cell populations. This population is heterogeneous at any level of the hierarchy that describes it. Even at the lowest level, cell populations are heterogeneous - clones, subclones, fractions, etc. Measuring and describing this heterogeneity is the most important source of information for the hematologist.

Other living populations

Although this is somewhat beyond the scope of this article, hematology researchers deal not only with human cell populations. For example, bacterial and viral microorganisms—populations encountered in hematology clinical practice—have their own specificity and diversity, characteristic only of a hematology hospital.

The simplest ones from the point of view of "ensemble" consideration are populations of experimental animals. As a rule, these are collections of individuals that are, if not identical, then close in biological and genetic characteristics.

Non-living populations

Blood component units are not truly mass-produced. Each unit (dose) of donor blood components has a number of characteristics (for example, Rh group,

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immunophenotype) that make these units purely individual. A population approach can and should be used to study them. For example, sampling quality control algorithms used for batch products with standard individual characteristics are not suitable for batches of blood component units, where variability in characteristics is an inherent natural quality.

Mechanisms of formation

All the populations listed and of interest to the hematologist researcher are actually subpopulations. Patients with diseases of the blood system are a subpopulation of the so-called general population, and newly diagnosed and registered patients are a subpopulation of all patients suffering from this nosological form. In all cases, the mechanisms of formation or formation of "daughter" subpopulations from the "mother" (main) are important and should be the subject of research.

All target populations live in time, new members of the group enter the studied group, someone leaves it. The composition of the population being studied changes over time and is determined by the operation of certain mechanisms—inclusion and exclusion (exit) criteria. Patient selection for a clinical trial is the criteria for inclusion in the study and uncontrolled selection of patients. For population studies, these are screening mechanisms; for the donor contingent - programs involving recruitment and selection; for cellular "ensembles" - factors, for example, cell proliferation and differentiation. Mechanisms for exiting the population are exclusion of the patient from the study or death, withdrawal for epidemiological reasons for donors of blood components or bone marrow.

For donor blood components, fresh frozen plasma undergoing quarantine is also a unique population, which has its own entry mechanisms, such as quarantine and exit mechanisms - its rejection, write-off due to its expiration date, issuance for inactivation, processing or to clinical departments.

So, what is common to the populations under consideration is that any of them "lives" in time, each of them has entry and exit mechanisms that determine and regulate its composition. The composition and its changes over time largely determine the expected results of research in a given group, the possibility and legitimacy of their extrapolation both downwards - to a single object, and upwards - to the "maternal" main population.

Heterogeneity

All populations, except perhaps groups of experimental animals, are heterogeneous. Even the clone of leukemia cells being studied experiences changes over time, as additional mutations with chromosomal aberrations appear in the daughter subclones. The nature of their heterogeneity can also change over time. In a clinical trial, after recruitment of patients has ceased, the study group of patients at risk of high mortality becomes more homogeneous over time due to a natural decrease in the number of patients as constituent elements of the group. Even in a more stable population, due to various external (subjective and objective) reasons, its composition may change if the rules and inclusion/exclusion criteria change.

Population characteristics

A population is a collection of its members, each of which, in turn, can be described using a set of specific parameters. But the values of these parameters for different members of the population are also different, different from each other. The population at each time point as a whole is characterized by statistical estimates of the distribution of these parameters. In general, events occur in a population that change its composition and the parameters of its individual members.

Random and non-random entry/exit processes and key events occurring within a group are essential attributes of a population. Obtaining these characteristics is the most important object of study of populations. The tools used in such studies are largely common across different hematology populations.

CONCLUSION

Population hematology is not only the hematological branch of traditional population medicine and epidemiology, the main object of which is patient populations. Its uniqueness lies in the fact that its basic object is a hierarchy of two nested populations: blood cells and patient groups. In addition, hematological populations are constantly changing over time. Taking into account the time factor, staging, long-term observation are unique features of the methodology of population hematology. The peculiarity of the described direction of medical science also lies in the interaction (linkage) of target populations.

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