REVIEW
of the official reviewer for dissertation work
AIYM KAIYRLYKYZY **on the theme «Risk factors associated with Alzheimer's disease in Kazakhstan» presented for the degree of Doctor of Philosophy (PhD) in the specialty «8D10101 – Public Health».**

№	Criteria	Eligibility (one of the options must be checked)	Justification of the position of the official reviewer
1.	The topic of the thesis (as of the date of its approval) corresponds to the directions of development of science and/or state programs	1.1 Compliance with priority areas of science development or government programs:	
		1) The thesis was completed within the framework of a project or target program financed from the state budget (indicate the name and number of the project or program) 2) The thesis was completed within the framework of another state program (indicate the name of the program) 3) The dissertation corresponds to the priority direction of the development of science, approved by the Higher Scientific and Technical Commission under the Government of the Republic of Kazakhstan (indicate the direction)	The dissertation work was completed within the framework of grant funding from the Ministry of Science and Higher Education (AP14871338, AP09259730) and as part of the Nazarbayev University Collaborative Research Program grant (No. 091019CRP2112).
2.	Importance for science	The work makes/does not make a significant contribution to science, and its importance is well disclosed/not disclosed	The dissertation makes a significant contribution to science by providing valuable findings on risk factors associated with Alzheimer's disease in Kazakhstan. The comprehensive approach and analysis of genetic, lifestyle, and biological factors are particularly noteworthy. The results are scientifically relevant and may contribute to improving the understanding and prevention of Alzheimer's disease. The scientific and practical importance of the research is clearly presented and well justified.
3.	The principle of independence	Self-reliance level:	The candidate demonstrated a high level

		1) High; 2) Medium; 3) Low; 4) No independence	of independence throughout the research process, including study planning, data collection, statistical analysis, interpretation of results, and preparation of the dissertation. The candidate's scientific independence is also reflected in publications related to the dissertation topic in peer-reviewed scientific journals.
4.	The principle of inner unity	4.1 Justification of the relevance of the thesis: 1) Justified; 2) Partially justified; 3) Not justified.	The relevance of the dissertation is well justified by the growing importance of Alzheimer's disease as a public health problem. The author highlights the need to investigate its risk factors in the Kazakhstani population, taking into account the limited availability of population-specific research in this field. The research addresses an important scientific and practical issue.
		4.2 The content of the thesis reflects the topic of the thesis: 1) Reflects; 2) Partially reflects; 3) Does not reflect	The content of the dissertation fully corresponds to its title and research topic. The chapters provide a comprehensive examination of various risk factors associated with Alzheimer's disease, including sociodemographic, lifestyle, genetic, biochemical, dietary, and microbiome-related aspects. The structure and content adequately cover the main areas of the research.
		4.3. The purpose and objectives correspond to the topic of the thesis: 1) correspond; 2) partially correspond; 3) do not correspond	The aim and objectives are clearly formulated and are directly related to the dissertation topic. They are consistent with the research design and reflect the main directions of the study. All major objectives are addressed through the presented research methods and results.

		4.4 All sections and provisions of the thesis are logically interconnected: 1) completely interconnected; 2) the interconnection is partial; 3) there is no interconnection	The dissertation demonstrates a clear and logical structure. The introduction, literature review, methodology, results, discussion, and conclusions are closely interconnected. The research findings are presented in a consistent manner, and the conclusions follow logically from the objectives and results of the study.
		4.5 The new solutions (principles, methods) proposed by the author are reasoned and evaluated in comparison with the known solutions: 1) there is a critical analysis; 2) partial analysis; 3) the analysis does not represent one's own opinions, but quotes from other authors	The author provides a comprehensive analysis of the obtained findings and evaluates them in comparison with previously published scientific evidence. The discussion demonstrates critical thinking, an understanding of current scientific knowledge, and the ability to interpret the results independently. The proposed scientific findings are sufficiently supported by the research data and contribute to expanding knowledge about Alzheimer's disease risk factors in Kazakhstan.
5.	Scientific novelty principle	5.1 Are the scientific results and provisions new? 1) completely new; 2) partially new (25-75% are new); 3) not new (less than 25% are new)	The dissertation presents original scientific findings based on a comprehensive investigation of Alzheimer's disease risk factors in the Kazakhstani population. The study provides new population-specific evidence on sociodemographic, genetic, biochemical, lifestyle, dietary, and microbiome-related factors. The results contribute to expanding scientific knowledge in this field.
		5.2 Are the dissertation findings new? 1) completely new; 2) partially new (25-75% are new);	The findings offer valuable new insights into the risk factors associated with Alzheimer's disease in Kazakhstan.

		3) not new (less than 25% are new)	Particularly noteworthy are the identification of functional illiteracy as an important predictor, the investigation of regional and sex-specific differences in genetic associations, and the analysis of potential biochemical and molecular markers. These findings have scientific novelty and practical relevance.
		5.3 Technical, technological, economic or management decisions are new and reasonable: 1) completely new; 2) partially new (25-75% are new); 3) not new (less than 25% are new)	The dissertation applies a combination of established research methods and innovative approaches to investigate Alzheimer's disease risk factors. The integration of genetic, biochemical, dietary, and microbiome analyses provides additional scientific value. The proposed approaches are reasonable and relevant to the research objectives.
6.	The validity of the main findings	All main conclusions are/are not based on scientifically significant evidence or well-grounded (for qualitative research and areas of training in the arts and humanities)	The main conclusions of the dissertation are supported by the results of the conducted research and appropriate statistical analyses. The findings are consistent with the research objectives and are presented with sufficient scientific justification. The author demonstrates the ability to interpret the results correctly and draw evidence-based conclusions. Overall, the conclusions are scientifically sound and adequately supported by the collected data.
7.	The main provisions for the defense	It is necessary to answer the following questions for each provision separately: 7.1 Is the provition proven? 1) proven; 2) rather proven; 3) rather not proven; 4) not proven	The main provisions submitted for defense are scientifically justified and supported by the research findings and statistical analyses. They demonstrate scientific novelty, originality, and practical relevance. The provisions are

		7.2 Is it trivial? 1) yes; 2) no 7.3 Is it new? 1) yes; 2) no 7.4 Application level: 1) narrow; 2) medium; 3) wide 7.5 Is it proven in the article? 1) yes; 2) no	consistent with the dissertation objectives and are reflected in the candidate's scientific publications. Overall, they represent a valuable contribution to understanding Alzheimer's disease risk factors in the Kazakhstani population.
8.	The principle of reliability Reliability of sources and information provided	8.1 Choice of methodology - is justified or the methodology is described in sufficient detail 1) yes; 2) no	The research methodology is appropriate and well justified in relation to the aim and objectives of the dissertation. The study design, participant selection, data collection procedures, and statistical methods are described in sufficient detail.
		8.2 The results of the thesis were obtained using modern methods of scientific research and methods of processing and interpreting data using computer technologies: 1) yes; 2) no	The author used modern methods of scientific research and statistical analysis, including multivariable regression, genetic and biochemical analyses, epigenetic assessment, and microbiome sequencing. Computer-based tools were appropriately applied for data processing and interpretation.
		8.3 Theoretical conclusions, models, identified relationships and patterns have been proven and confirmed by experimental research (for areas of training in pedagogical sciences, the results have been proven on the basis of a pedagogical experiment): 1) yes; 2) no	The main conclusions and identified associations are supported by the empirical findings of the case-control study. The results of genetic, biochemical, and microbiome analyses provide additional evidence for the relationships identified in the research.

		8.4 Important statements are confirmed / partially confirmed / not confirmed by references to current and reliable scientific literature	The dissertation refers to relevant scientific publications and contemporary research in the field of Alzheimer's disease. The literature review provides an appropriate scientific background and supports the interpretation of the main findings.
		8.5 Used literature sources are sufficient/not sufficient for a literature review	The dissertation includes a substantial number of scientific references covering the main research areas. The selected literature provides a solid theoretical foundation and demonstrates the author's familiarity with current scientific knowledge.
9	Practical value principle	9.1 The thesis has theoretical value: 1) yes; 2) no	The dissertation has significant theoretical value, as it expands scientific understanding of Alzheimer's disease risk factors in the Kazakhstani population. The findings contribute to knowledge in genetic, biochemical, epidemiological, and lifestyle-related aspects of the disease.
		9.2 The thesis is of practical importance and there is a high probability of applying the results obtained in practice: 1) yes; 2) no	The research findings have practical importance for public health and may contribute to the development of targeted prevention strategies, early risk assessment, and improved awareness of Alzheimer's disease risk factors in Kazakhstan.
		9.3 Are the practice suggestions new? 1) completely new; 2) partially new (25-75% are new); 3) not new (less than 25% are new)	The practical recommendations combine established approaches to dementia prevention with new population-specific findings. The identification of locally relevant risk factors and potential biomarkers provides a basis for developing more tailored prevention and

			risk assessment strategies.
10.	The quality of writing and design	Academic writing quality: 1) high; 2) average; 3) below average; 4) low.	The dissertation is written in a clear and coherent academic style. The text is logically structured, the terminology is appropriate, and the scientific results are presented in a consistent manner. The author demonstrates good academic writing skills and the ability to communicate complex scientific information effectively. Overall, the quality of writing and presentation meets high academic standards.
11.	Notes on a thesis		No significant remarks or comments regarding the dissertation were identified.
12.	Scientific level of the doctoral student's articles on the topic of research (in case of defense of the dissertation in the form of a series of articles, the official reviewers comment on the scientific level of each article of the doctoral student on the topic of research)		The doctoral student's research findings have been disseminated through 16 scientific publications, including five articles in international peer-reviewed journals indexed in Scopus and Web of Science, demonstrating a good scientific level and the relevance of the research to the international scientific community.
13.	Decision of the official reviewer (pursuant to paragraph 28 of the present Model Regulations)	1) to award the degree of Doctor of Philosophy (PhD) or Doctor of Specialization	The doctoral dissertation entitled "Risk Factors Associated with Alzheimer's Disease in Kazakhstan" fully meets the requirements of the Rules for Awarding Degrees approved by the Committee for Quality Assurance in Science and Higher Education of the Ministry of Science and Higher Education of the Republic of Kazakhstan. During the review of the dissertation, the

			following questions arose, and I would appreciate the doctoral candidate's responses: 1. How can your research findings contribute to shaping national priorities for Alzheimer's disease prevention in Kazakhstan? 2. What specific public health measures would you recommend based on your findings to improve public awareness and reduce the risk of Alzheimer's disease in Kazakhstan? Based on the scientific significance, novelty, and practical relevance of the research findings, the doctoral candidate Aiym Kaiyrlykyzy deserves to be awarded the degree of Doctor of Philosophy (PhD) in Public Health.

Official Reviewer:
PhD, Senior Lecturer, Acting Associate Professor,
Department of Epidemiology and Biostatistics,
Semey Medical University (Semey, Kazakhstan)
(place of work, academic title)

(signature)

Assel Tukinova
(FULL NAME)

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