

# Comparative Assessment of Women's Reproductive Health in the Areas Bordering With the Aral Sea Region

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## Abstract

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**AIM:** We examined 435 women of Aktobe region and 328 women of South Kazakhstan region, living in areas bordering the Aral Sea region during the study and comparative assessment of the impact of climatic and anthropogenic factors of Aral region on the reproductive health of the female population.

**MATERIAL AND METHODS:** The survey based on the comprehensive clinical-functional and laboratory studies accounting the regional and environmental ecological factors. Survey subject was the area of 2 settlements of Aktobe region and 1 settlement of South Kazakhstan region.

**RESULTS:** In all three areas it was revealed that the examined women had the later menarche. There is a trend towards younger age for menopause. The women of South Kazakhstan region often suffer from the pelvic inflammatory disease.

**CONCLUSION:** Perinatal losses, the case of spontaneous interruption and stagnant pregnancy in history, which can be repeated, one in three women has in the zone of ecological disaster.

## Introduction

Desertification is the appearance landscape close to the desert with sparse plant cover under the influence of human activities. At the desertification biological products, species diversity is dramatically reduced, and soils collapse. One of the most tragic events of this century is an environmental crisis in the Aral Sea region. Located in the middle of the desert, the sea had the beneficial effect on the climatic and environmental conditions surrounding regions, and it was humidity control over a vast area of Aral Sea region, the guard from hot winds coming from the southern deserts.

More than 2.5 million hectares of dead desert almost devoid of vegetation appeared at the decrease of the Aral Sea, whose level dropped by 14 m. Irreversible processes of degradation of the environment lead to a deterioration of living conditions, increased morbidity and need the legal

regulation of social protection of the population, living in environmentally disadvantaged areas. The modern social situation in Kazakhstan is characterised by the fact that from the areas, located in the desert area, the annual population exodus reaches hundreds of thousands.

Low living standards, malnutrition, lack of medical care, the water unfit for drinking, dust and salt storms, resulting from ecological imbalance and degradation of habitat, led to a sharp deterioration in the health of the population, reduced life expectancy, reduction of population growth that is a precursor of demographic distress.

Kazakh part of the Aral Sea region covers 59.6 million hectares of lands, including the area of Kyzyl Orda region (22.6 million hectares), Aktobe region (19.7 million hectares), Karaganda region (8.7 million hectares) and South Kazakhstan (8.6 million hectares) areas, or 22% of the total area of the Republic of Kazakhstan.

### **Anthropogenic factors leading to desertification in Kazakhstan**

Anthropogenic factors leading to the occurrence and development of desertification processes in Kazakhstan have connected mainly with such kinds of economic activities as cattle grazing; agriculture; the development of mineral resources; construction and operation of industrial, military and civilian facilities, irrigation and linear structures. Desertification is also the result of illegal logging, stump shrubs and dwarf shrubs for fodder and fuel, forest and steppe fires, haphazard recreation organisation dumps around settlements, pollution of soil and groundwater with toxic substances, effects of transport. The Aral Sea region is dominated by saline (10.7 million hectares), alkaline (9.9 million hectares), crushed stoned (3.2 million hectares) lands. Almost all the irrigated lands are affected by salinity. The largest areas of saline lands are Kyzyl Orda region (4.7 million hectares), Aktobe region (3.3 million hectares) and solonetzic – in Aktobe region (5.0 million hectares), Karaganda region (1.9 million hectares), South Kazakhstan areas (1.6 million hectares). The degradation of pastures and vast grassland is ongoing. In the last two decades, there is the decrease of the total area of pasture from 45.0 million hectares to 41.5 million hectares and the increasing of the area of degraded pastures from 4.8 million hectares to 6.4 million hectares [1].

### **Demographic distress and consequences to overall health and women's reproductive health**

The modern social situation in Kazakhstan is characterised by the fact that the annual exodus reaches hundreds of thousands of people from the desert area. Health is an important medical and social category, which is associated with the development of human resources in the state. Reproductive health is an important part of overall health and takes the central place in human development. Reproductive health concerns personal and highly valuable aspects of life. As a reflection of the quality of health in childhood and adolescence, supporting reproduction, it also provides the basis for health after reproductive years of life, both women and men, and it determines the consequences handed down from generation to generation. In the context of ecological imbalance, it increases the frequency of the pathological course of pregnancy, perinatal morbidity and mortality, miscarriage.

The most objective criteria when selecting the base is the dynamics of health indicators like an infant, maternal and total mortality and fertility, the life expectancy of the population. Despite the downward trend in infant mortality in the region of the Aral Sea from 23.89‰ in 2008 to 19.1‰ in 2013 per 1 000 live births, the mortality rate among low birthweight and

premature infants was 60.3%. The main cause of infant mortality is perinatal pathology (66.3%), the second place took congenital malformations (14.4%), and the third place was occupied by respiratory diseases (7.6%) [2, 3].

The environmental situation in South Kazakhstan is becoming increasingly important. In recent years there are more and more sources of emissions of harmful substances into the environment of the region. There is an increased content of radionuclides in groundwater, zones of increased soil contamination by heavy metals. The main concern of the soil is affected by lead, zinc and arsenic in concentrations that in 10 times higher than maximum permissible concentration. It affects large areas and, in particular, the area designated for the cultivation of vegetable crops. The problems of oil pollution are gaining strength as a result of lack of effective environmental controls. The health of the population of the South Kazakhstan region is deteriorating with the increasing of the deterioration of the environment. The consequence of a well-developed industry of Aktobe region is a high anthropogenic impact on the environment, reflected in the pollution of air, soil, and big rivers, in the accumulation of industrial waste and municipal solid waste. The main pollutants of lands of Aktobe region are the establishments of the chemical industry, oil and gas production and oil refining, agriculture. The areas, where oil production is carried out, are characterised by soil pollution with oil and oil products. The areas, where the mining and milling of minerals are realising, are characterised by such main pollutants as chromium, boron, phosphorus, agricultural – fluorine, phosphorus and others.

The literature data demonstrates that the most informative characteristic of the environment is the indicators of the reproductive function of women as the most vulnerable to adverse factors of different origin. The studies have shown that women's reproductive disorders manifest by increased incidence of preeclampsia, threatened abortion, miscarriage, premature birth, abnormal labour, fetal malnutrition, chronic intrauterine hypoxia and birth asphyxia, hypokalaemia.

The aim of this study was to evaluate the reproductive health of women in those areas of Aktobe and South Kazakhstan regions, which border the Aral Sea region on the base of integrated clinical, functional and laboratory studies accounting the regional environmental and ecological factors.

## **Materials and Methods**

The subject was the area of 2 settlements of Aktobe region and the settlement of South

Kazakhstan region. The groups formed by stratification (according to the gender) and equal quota selection of women in the following groups: 18-29 years, 30-39 years, 40-49 years in each locality. The inclusion criterion was the time factor of residence of women of reproductive age 18-49 years in the area of ecological trouble during not less than 5 years, employment in occupations with hazard not higher than second class. The material of the study was blood, vaginal contents. Clinical and instrumental investigations: inspection of the cervix in the mirror, smears for the purity, onco-cytology, bimanual examination, examination of the breasts, Ph definition of vaginal content.

## Results

The environmentally disadvantaged areas of the Aral Sea region of the South Kazakhstan region are Arys settlement, in Aktobe region – Yrgyz and Shalkar settlements. We examined 763 women at the age from 18 to 50 years. In both areas there was registered the later menarche at the age over 16 years, accounting 35.45% (s. Arys – 35%, s. Shalkar – 36.4%, s. Yrgyz – 34.94%). The later menarche is most typical for girls with body weight deficit, with chronic diseases, mental and physical activities, in the case of the effects on the body of toxic substances. These girls need in the careful examination and in the interventions to prevent disorders of the reproductive system in the future, including infertility, complicated pregnancy and childbirth, early occurrence of other abnormalities in the reproductive system. Also, the later menarche may indicate more serious problems like lack of ovarian, uterine disease, dysfunction of hypophysis or the disorders of the endocrine glands. At the late menarche in the absolute majority of girls the regular menstrual cyclicity for a long time is not set, in 1/3 of them the rare and scanty menstruation is stored until childbearing age, and in such cases, the primary oligomenorrhea is diagnosed. During the analysis of gynaecological diseases, it should be noted that inflammatory processes predominate in the age groups of 18-29 and 30-39 years in every studied region. The inflammatory diseases on average are registered in 23% of cases in Aktobe region and 36% of cases in the South Kazakhstan region. The disease of cervix uteri was registered in 101 women in Aktobe region, and it was 61.9% of all women with inflammatory diseases of the uterus and appendages. The cervical disease was found in 64 cases in South Kazakhstan region, accounting for 48.9% of all women with inflammatory diseases of the pelvic organs. The presence of cervical disease is prevalent in the group of 30-39 years. The peculiarity of vaginal microflora is its variability under the impact of different factors depending on the age, menstrual cycle, the

phase of reproductive function, sexual activity, and level of sex hormones, contraceptive, frequency and nature of hygienic procedures, immune and emotional status. The disease is caused not only by a single microbe but by some organisms living in the vagina as a result of a violation of the ratio of their community and the predominance of anaerobic microorganisms. The pathological changes of balance and relations among vaginal microorganisms can be caused by a variety of pathogens. Such factors include the unsatisfactory social conditions, excessive use of personal care products, long-term use of intrauterine contraceptive devices, various infectious diseases, neuro-endocrine disorders (including the diseases accompanied by dysfunction of the ovaries). In all of the surveyed women were determined Ph of vaginal contents and carried the on-cytological examination of the cervix.

Cervical cancer is currently the most frequent malignant disease of female genital mutilation. It is about 12% of all malignancies, which identified in women. The real prevention of cervical cancer is early diagnosis and treatment of precancerous cervical disease. It is registered the defined phasing and staging of the pathological processes in the development of cervical carcinogenesis. There are background and precancerous diseases, carcinoma in situ and widespread cervical cancer. The results of cytological smears signs at ASCUS (atypical squamous cells of undetermined significance, including inflammation) were registered in Aktobe region – in 11.4% (among them 61% in Shalkar city and 39% in the settlement Yrgyz). ASCUS was diagnosed in 4.3% women of South Kazakhstan region.

*Dysplasia* is the expressed proliferation of atypical cervical epithelium with violation of its «layering» without the involvement of stroma and germinal epithelium. Although cervical dysplasia often does not cause any symptoms, it is a potentially dangerous disease, because it can progress to cervical cancer, the second leading type of cancer, which kills women, especially young girls. All over the world cervical cancer kills 11.6% of women [4, 5, 10]. The frequency of the transition of dysplasia to preinvasive carcinoma is 40-64%. The histological classification of dysplasia: Cervical intraepithelial neoplasia (CIN) is divided into CIN I – mild dysplasia; CIN II – moderate dysplasia; CIN III – severe dysplasia and preinvasive cancer. We diagnosed cervical intraepithelial neoplasia (CIN) in Aktobe region: CIN I occurs in 4%, CIN II – in 0.5%. In South Kazakhstan region CIN I was registered in 2%, CIN II was not found.

The results of cytological screening are presented in Table 1.

**Table 1: Cytological screening data (absolute numbers - %)**

Region	Age, years		18-29				30-39				40-49			
	Nosology	ASC US	CIN I	CIN II	Bacterial diagnosis	ASC US	CIN I	CIN II	Bacterial diagnosis	ASC US	CIN I	CIN II	Bacterial diagnosis	
Aktobe region	s.Shalkar, 83-76-80	5 – 6%	2-2.4%	-	4- 4.8%	12-15.8%	2 – 2.6%	-	16-21%	11-13.8%	4-5%	1-1.25%	10-12.5%	
	s.Yrgyz, 56-52-58	7-12.7%	-	1-1.8%	5-8.9%	6-11%	4-7.7%	-	4-7.7%	5-8.6%	4-6.9%	-	13- 22.4%%	
Kazakhstan region	s.Arys, 104-112-112	3-2.8%	-	-	7-6.7%	2-1.8%	4-3.6%	-	18- 16%	9-8.04%	3-2.7%	-	18- 16%	

The problem of infertility is currently represented much more serious than it was before, a few centuries ago. Early sex increases the number of venereal infections; young people adhere to delay the birth of children. WHO estimates the incidence of infertility in women as 40%, men – 45%, and 15% due to the presence of incompatibility of spouses and immunological factors. The causes of infertility can be the defects in the development of the reproductive system, disruption of the genitals, severe intoxication and general diseases of the body as well as mental and neurological disorders. Infertility is not a separate disease group; it always appears as a result of various diseases of the body. The main cause of female infertility is inflammatory diseases. The main medical causes of infertility are problems with ovulation (36%), obstruction of the fallopian tubes (30%) and endometriosis (18%) [6, 8]. Figure1 presents our comparative data on the prevalence of primary and secondary infertility in the studied regions.

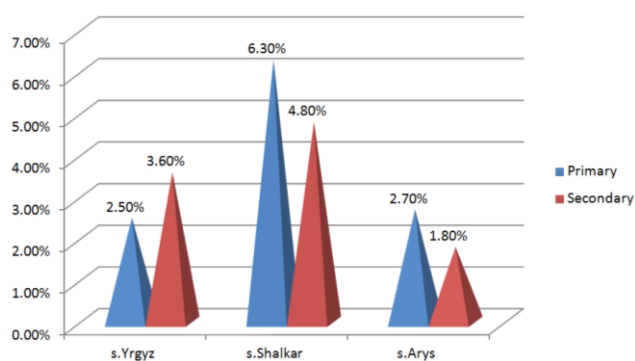


Figure 1: Comparative data on prevalence of primary and secondary infertility in the studied regions

According to our research, we revealed 9% of women with infertility in the Aktobe region, of which primary infertility had 2.9%, secondary – 5.6%. Infertility occurs 4.5% (primary – 2.7%, secondary – 1.8%) in the South Kazakhstan area.

There was a trend towards a younger age of menopause become. The average age of menopause in the Aktobe region is 41.5 years. The frequency of menopause in Shalkar city is 31% of premature and 44% early, in settlement Yrgyz – 25% premature and

33% early. The frequency of menopause in the South Kazakhstan region: settlement Arys – 0.9% premature and 2.13% early. We have to take into account that these percentage values are not so high, but not stacked in the average data of WHO [7]. Early or premature menopause usually occurs in 1-4% of women. Premature menopause is the cessation of reproductive life at an unusually early age, sometimes in adolescence. The exact nature of premature menopause is unclear. The process of ovarian failure is complex and lengthy in time. The various embodiments of this process have its occurrence time, but the difference between them is more artificial. Premature menopause can be caused by any factors which reduce the number of follicles. According to international studies, it was found that high levels of some chemical compounds in the tissues of women associated with the early onset of menopause. These compounds are the parts of plastic products, personal care products and other items found in the environment. Chemical, environmental factors acting at the minimum threshold levels reduce the overall resistance of the body and contribute to the realisation of true teratogenic and embryo-toxic substances and the appearance of various genetic disorders. Perinatal losses according to the anamnesis of women in the Aktobe region took 30%, in the South Kazakhstan region – 29%.

The number of abortions among women of reproductive age in the study area was following: 35% in Aktobe region, 27% - in the South Kazakhstan region. It should be noted that with the increasing of women age the number of use of abortion as a method of contraception increased in all studied regions. In the age group of 18-29 years, the abortion rate is 4.5%, in the group of 30-39 years – 26%, and in the group of late reproductive age – 47%. Among the complications of pregnancy and childbirth in all studied regions, the leading position occupied by the premature birth – 11% in Aktobe region and 15% in South Kazakhstan region. Bleeding is more common in the South Kazakhstan region (9.5%), whereas in the Aktobe region this index was less in 3 times. Arterial hypertension was diagnosed in 3.2% of cases in Aktobe region and 2.7% of cases in South Kazakhstan region.

When establishing the parity of births and data of perinatal outcomes in women it was revealed the presence of children who have birth defects and inherited genetic diseases: in Yrgyz settlement – 3 cases of congenital malformations including 2 cases of congenital heart disease of the fetus and 1 case of congenital malformations of the digestive tract. In Shalkar city we had registered 2 cases of congenital malformations of the fetus, including 1 case of congenital heart disease and 1 case of congenital malformations of the urinary system of the fetus. We revealed 14 cases of congenital malformations in the settlement Arys, among which 6 cases of fetal congenital heart disease and 5 cases of congenital malformations of the central nervous system, 1 case of multiple malformations, 2 cases of the musculoskeletal system. Thus, the leading position of congenital malformations in children takes n. Arys in South Kazakhstan region.

## Discussion

Thus, assessing the prevalence of gynaecological incidence, we can conclude that the prevalence of inflammatory diseases does not effect by the development of the industrial complex and human activities. The bacterial vaginosis was diagnosed by the presence of complaints, clinical signs, data of Ph-metre and vaginal cytology data. The greatest number of women suffering from bacterial vaginosis was detected in Aktobe region in the age group of 30-39 and 40-49 years (15.8% and 16.4% respectively). The bacterial vaginosis was diagnosed in 4% of women in South Kazakhstan region. Thus, it can be assumed that the greatest frequency of occurrence of signs of cervical changes in the cervix in the Aktobe region can be explained by the influence of external factors of the environment of the physicochemical nature. A high anthropogenic impact on the environment, expressed in the pollution of atmospheric air, soil and large rivers, the accumulation of industrial waste and solid domestic waste in the region. Thus, almost every third woman has in the history the spontaneous abortion and non-developing pregnancy.

Thus, according to the results of the assessment of women's reproductive health and clinical examination we can make the following conclusion: 1) We revealed the high level of gynaecological endocrine pathology. The late menarche is registered in 36% and 35% respectively in the study area of Aktobe region (Shalkar city, settlement Yrgyz) and South Kazakhstan region (settlement Arys); 2) Perinatal loss is registered in 30% women of Aktobe region and 29% of women in the South Kazakhstan region. almost every third woman has in the history the spontaneous abortion and non-developing pregnancy; 3) According to our

research we revealed 9% of women with infertility in the Aktobe region, of which primary infertility had 2.9%, secondary – 5.6%. Infertility occurs 4.5% (primary – 2.7%, secondary – 1.8%) in the South Kazakhstan area; and 4) The examination for tumour markers of cervical cancer and prolactin has not revealed statistical significance.

In conclusion, we can say that: 1) The frequency of pathology of pregnancy, childbirth and neonatal morbidity affected by adverse anthropogenic (pollution of air, water and soil) and social (low levels of employment and welfare) factors; 2) Adverse human-made environmental factors contribute to the increased frequency of antenatal mortality, congenital malformations, fetal malnutrition and neonatal morbidity; 3) The adverse social and environmental factors increase the risk of a pathology of pregnancy (spontaneous miscarriage, anemia, pregnancy, diseases of the genitourinary system, preeclampsia); and 4) The indicators of reproductive health it is advisable to take into account for the assessment of the environmental situation in the region and to make management decisions on social and economic development of the region and the organization of obstetric care.

Our assumption about the complex impact of negative environmental factors and toxicants on women's reproductive health are consistent with previous studies of domestic and foreign scientists.

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