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PHARMACOECONOMIC AND EPIDEMIOLOGICAL BASES OF OPTIMAL ROTAVIRUS VACCINE SUPPLY FOR UKRAINIAN POPULATION

Serhii O. Soloviov^{1,2}, Hennadiy A. Mokhort³, Olena P. Trokhimenko¹, Hleb V. Zahoriy¹, Viktor V. Trokhymchuk¹, Iryna P. Kolesnikova³, Iryna V. Dziublyk¹

¹SHUPYK NATIONAL MEDICAL ACADEMY OF POSTGRADUATE EDUCATION, KYIV, UKRAINE

²THE NATIONAL TECHNICAL UNIVERSITY OF UKRAINE "IGOR SIKORSKY KYIV POLYTECHNIC INSTITUTE", KYIV, UKRAINE

³BOGOMOLETS NATIONAL MEDICAL UNIVERSITY, KYIV, UKRAINE

ABSTRACT

Introduction: Several studies have shown that rotaviruses play a leading role in the structure of acute intestinal infections (AII) of viral etiology in children. In the National vaccination calendar of Ukraine, vaccination against rotavirus infection (RVI) is classified as recommended, with the expected goal of reducing the number of severe RVI cases among under five-year-old children. Nevertheless, despite the positive epidemiological and clinical effects of vaccination against RVI, it remains unclear how appropriate the introduction of rotavirus vaccines is in terms of potential costs and benefits, as well as determining the optimal level of subsidy required to cover part of the costs of voluntary vaccination of the population.

The aim: Study of optimal subsidy level of rotavirus vaccine in Ukraine using epidemiological and pharmacoeconomic modeling.

Materials and methods: The retrospective epidemiological data of the monthly RVI incidence in Ukraine as well as the population number from 2010 to 2016 formed the information basis for determining the transmission parameter of the viral agent. The scenario of RVI epidemic process as an acute intestinal infection from the point of view of mathematical epidemiology is best described by developed mathematical model. Cost-benefit of rotavirus vaccination was studied with the use of developed pharmacoeconomic criteria.

Results and conclusions: Prediction of possible implications of RVI vaccination and finding optimal level of vaccine supply involves a comprehensive study of the epidemic process peculiarities of this infection with development of an adequate epidemiological model. We have proposed a model of RVI epidemiological process in Ukraine, determining its main parameters with the use of available retrospective data of annual number of RVI cases for the period from 2010 to 2016. The developed model was used as an analytical tool for analyzing influence of different levels of vaccine supply on vaccination cost-benefit. The results of research showed that the use of epidemiological modeling in pharmacoeconomic analysis of rotavirus vaccination made it possible to determine analytically optimal level of vaccination subsidy level.

KEY WORDS: rotavirus infection, epidemiological model, vaccination, pharmacoeconomic modeling, subsidy

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INTRODUCTION

The problem of acute intestinal infections (AII) global spread is currently relevant [1-3], since they play one of the leading roles among infectious diseases after the influenza and acute respiratory diseases [4, 5]. The spectrum of agents causing AII is diverse and includes pathogenic and potentially pathogenic bacteria, protozoa, and viruses [6-8]. Several studies have shown that viruses cause from 25 to 60% of AII cases, among which rotaviruses play a leading role in the structure of children's AII of viral etiology [4, 9, 10]. According to the Global Disease Burden in 2015, rotavirus infection (RVI) remains the leading cause of morbidity and mortality in children aged under five years of age, despite a decrease in the number of admission cases associated with diarrhea and death [11, 12]. Despite the fact that the number of deaths caused by rotavirus gastroenteritis declined from 528,000 in 2000 to 215,000 in 2013, of which over 80% were recorded in Asian

and African countries, RVI continues to cause significant damage of public health across the world regardless of the economic development level, causing direct and indirect economic losses, estimated at hundreds of billions of dollars per year [13, 14].

Since 1973 and to date, most authors associate RVI with children, attributing it to the section of pediatric problems. As a result, often adults in the world are not examined for the rotavirus in case of AII. This fact is of fundamental importance, as it leads to a large number of non-detected RVI cases among different age groups [15]. However, despite the active role of adults in rotavirus spread, children aged under 5 years play a dominant role in its clinical structure.

WHO recommends rotavirus vaccination into the national immunization programs in countries with infant deaths of diarrhea > 10%, such vaccination introduced since 2006 in 20 countries in Latin America, the United States, Australia, South Africa, Belgium, Luxembourg,