Rotavirus disease burden in kenya health and social care essay

Globally, rotavirus is the most common cause of diarrhea requiring hospital care in young children, . Annually rotavirus gastroenteritis infection is estimated to cause 114 million episodes requiring home care, 25 million clinic visits, 2 million hospitalizations and approximately 600000 deaths in children below 5 years of age worldwide; an estimated 300000 deaths which is approximately 50% of the 600, 000 diarrheal related deaths occur in Africa, , The burden of rotavirus disease is significant in both developed and developing countries where almost all children by the age of 5 and 1 in 5 will visit a clinic, I in 65 will be hospitalized and approximately 1 in 293 will die, . However, the rates of severe outcomes including mortality are greater in developing countries possibly due to existence of co-morbidity, such as co-infections and malnutrition, and limited access to medical care,. In Kenya, rotavirus infection affects a similar population with peak infections observed between 5 and 12 months (Fig 1) of the first year, therefore an effective rotavirus immunization could alleviate this situation.

Fig: 1. Age distribution of Rotavirus disease burden in Kenya

Source: Adapted from burden and epidemiology of rotavirus diarrhea in Kenya and selected African countries, . In Kenya, the occurrence of rotavirus diarrhea has remained the same despite the overall reduction in diarrhea incidence due to enhanced sanitation and hygiene practices. The government of Kenya recommends the use of the latest WHO guidelines on diarrhea prevention; however within most communities, poor hygiene and sanitation practices persist. Moreover, despite the effectiveness of Oral Rehydration Solutions (ORS) for management of all diarrhea diseases, many

children still die due to rotavirus. Rotavirus vaccine has been recommended by WHO as the best strategy for reducing morbidity and mortality associated with severe dehydrating rotavirus infection given that factors of hygiene and sanitation do not influence the high morbidity of[1]rotavirus diarrhea in both developing and developed countries. This paper seeks to: (1) provide an update on the epidemiology and economic burden of diarrheal disease in Kenya; (2) outline the current prevention and control programs for Rotavirus and (3) the potential impact and cost-effectiveness of a national rotavirus vaccination program with the aim of influencing the decision to introduce the vaccine in Kenya. According to the Ministry of Health, diarrheal diseases causes 16 percent of deaths among children under the age of 5 in Kenya, second only to pneumonia; this exceeds the death toll due to AIDS, tuberculosis, and malaria, combined, . The majority of deaths occur among the poor who constitute an estimated 80% of the total population currently estimated at 40 million. A recent study estimated that annually, rotavirus infection causes 19% of hospitalizations and 16% of clinic visits for diarrhea among children under 5 years of age and causes 7500 deaths, 8781 hospitalizations, and 1, 443, 883 clinic visits and results in a loss of 105 DALYs (Disability adjusted life years) per 1000 children per year in Kenya, . The study further observed different morbidity and mortality risk ratios (table 1) across the nine provinces of Kenya with Nyanza Province having the highest rotavirus-associated mortality rates (164 deaths per 100, 000 children), . It is imperative to note that Nyanza province is one of the poorest provinces in Kenya.

Table 1: Input Adjustments: Rates of Mortality, Hospitalization, and Outpatient Visits Associated with Rotavirus Diarrhea among Children under 5 Years of Age and On-Time Vaccine Coverage for Diphtheria, Tetanus, and Pertussis (DTP) Vaccine, by Province, Kenya, 2007

Source: Adapted from rotavirus disease burden and impact and cost-effectiveness of a rotavirus vaccination program in kenyaIn 2010, the Ministry of public health and sanitation unveiled a new diarrheal disease control policy which reinforces the comprehensive prevention and treatment recommendations for diarrheal disease already outlined by WHO and UNICEF, which include: treatment, hygiene and sanitation, and immunization, . These new recommendations take includes two significant advances: a new formulation of oral rehydration solute (ORS) containing lower concentrations of glucose and salt (low molarity ORS), and the use of zinc supplementation in addition to rehydration therapy in the management of diarrheal diseases, . It emphasizes prevention and treatment of dehydration with ORS and fluids commonly available at home, breastfeeding, continued feeding during diarrhea episodes, selective use of antibiotics and providing treatment with zinc for 10 to 14 days as the critical therapies aimed at achieving the goal of reduced morbidity and mortality due to diarrheal diseases,. Although efforts to enhance sanitation and hygiene have decreased the overall incidence of diarrheal disease, the occurrence of rotavirus diarrhea has remained the same. Moreover, despite the efficacy of Oral Rehydration Solutions (ORS) for management of all diarrhea diseases including rotavirus, many children still die due to rotavirus mainly due to limited access or insufficient use of ORS,. In the absence of causative treatment for rotavirus and the fact that

hygiene, sanitation, environment and social economy do not influence the high morbidity of rotavirus diarrhea in both developing and developed countries, vaccination is the only preventive method for the most severe form of diarrhea. The development of rotavirus vaccine has consisted of multiple strategies, and of these, three vaccines have been licensed for global use to date. In 1998, the first rotavirus vaccine was licensed for routine use, a rhesus-human rotavirus re assortment-tetravalent vaccine (Rotashield), but was later withdrawn after about 9 months use in the USA because of its association with increased risk of intestinal intussusception . Since the withdrawal of Rotashield, two additional vaccines; Rotarix® and RotaTeqTM have been licensed and successfully incorporated into national immunization programmes of a number of countries . Both these vaccines have shown a comparable protective efficacy (85–98%) in preventing severe rotavirus diarrhea among children in developed countries mainly USA, Latin America and Finland, . However, lower efficacy rates have been observed in developing countries of Africa (61. 2–64. 2%) and Asia (48. 3%), . Some studies have argued that despite the low efficacies, none of them has up to date been associated with an increased risk of intussusception contrary to perceptions associated with the first vaccine. Therefore in 2009, considering observations from already implementing countries, WHO SAGE recommended the inclusion of these rotavirus vaccines in all childhood immunization programmes of the world; this recommendation allowed GAVI Alliance to accelerate introduction of the vaccine into the national immunization programmes of the world’s 72 lowest-income countries by subsidizing vaccine purchase for a limited time at a price of US$0. 10–0. 30 per dose, (Glass et al, 2006). Kenya was part of the large multicenter

randomized, double-blinded, placebo controlled trials designed and implemented for each new vaccine in five countries (3 in Africa and 2 in Asia) aimed at evaluating efficacy of pentavalent rotavirus vaccine (PRV) in preventing severe gastroenteritis. These randomized trials undertaken in Ghana, Kenya, Mali, Bangladesh and Vietnam showed the vaccine efficacy PRV against severe Rotavirus gastroenteritis (RVGE) was slightly lower 39. 3% (95% confidence interval [CI]: 19. 1-54. 7) for African than in Asian countries (48. 3 %, 95% CI 22. 3-66. 1), ; however the vaccine efficacy (VE) against severe RVGE through nearly 2 years of follow-up among 1308 Kenyan children was 63. 9% (95% CI: 5. 9- 89. 8). Through the first year of life, VE against severe RVGE was 83. 4% (95% CI: 25. 5- 98. 2), . This indicates a significant protection during the first year of life; a period characterized a sharp increase in rotavirus infection prevalence in Kenya. A recent study argues that although efficacy of RotaTeq® in Kenya indicted that the vaccine was not efficacious in preventing severe gastroenteritis from any cause in children attending a health care facility, it showed statistically significant efficacy against severe gastroenteritis of any cause in children visited at home and further suggests that a national rollout of the vaccine will prevent many diarrheal related morbidities and deaths, (Feikin et al., 2012). Why are children still dying in Kenya and what can be done? Currently Rotavirus vaccine is available in Kenya as part of baby friendly package at a cost of between $ 25- $35 per course making it unaffordable for the majority of Kenyan population that requires it most, . Until the vaccine is introduced to the Kenya Expanded Programme for Immunization (KEPI), many affected citizens will have to wait for this promising solution because the current costs remain a barrier to access and utilization of this

promising vaccine. Rheingans found that in (Fig 2) most countries, the CER (Cost effectiveness ratio) is highest (least cost-effective) and the benefit is the lowest for the richest quintile, primarily due to lower estimated mortality rates, in poorer quintiles, the benefit tends to increase due to increased mortality, but sometimes fluctuates due to lower vaccination coverage rates, . Based on his findings, introducing rotavirus vaccine into Kenya’s routine immunization programme is the only way to maximize the vaccines potential in preventing cases of severe gastroenteritis as it will ensure coverage of poor populations where the benefit is highest in terms of number of deaths averted.

Fig: 2. Estimated benefit (rotavirus deaths averted by 1000 births) and cost effectiveness ratio ($/DALY) by wealth quintile for 8 high mortality countries

Source: Adapted from distributional impact of rotavirus vaccination in 25 GAVI countries: estimating disparities in benefits and cost-effectiveness, In 2012 Vans predicted that introducing " PRV into the Kenya’s routine childhood immunization programme over a 5 year cumulated period would prevent 34% of the outpatient visits, 31% of the hospitalizations and 41. 5% of the deaths, associated with rotavirus; or in absolute numbers prevent 58, 262 outpatient visits, 4, 866 hospitalizations, and 1, 527 deaths, associated with rotavirus. Incidence associated with rotavirus would reduce to 1, 984 outpatient visits, 192 hospitalizations and 38 deaths per 100, 000 children aged less than 5year. The estimated prevented costs totaled US$1, 782, 761 (direct and indirect costs) with an associated 48, 585 DALYs accumulated over the same period of 5 years; furthermore, after conducting an impact

assessment on the current immunization programme and cold chain, the study suggests that vaccination against rotavirus disease is cost-effective for Kenya irrespective of the vaccine, . It is apparent diarrhea related deaths, hospitalizations and outpatient consultations not only contribute major economic burden but also exerts extra strain on the existing health system thus the need for a long lasting solution. It is evident that despite the demonstrated effectiveness of PRVs, advocacy and recommendations by WHO SAGE, and the subsidized vaccine prices by GAVI; introduction of rotavirus vaccines into national immunization programmes has been rather slow. Globally, issues of their lower effectiveness in low-income countries and concerns about vaccine price have been suggested as hindering vaccine introduction; furthermore, there are still some mistrust due adverse effects and intussusceptions from the earlier vaccine, Rota shield, . In developing countries, Cherian suggests two groups of issues which have also been highlighted by WHO (2009) for consideration when implementing a new vaccine. The first is policy related issues: public health priority, disease burden, efficacy, quality, safety, other interventions (including other vaccines), economic and financial issues, . The second is programmatic related issues: vaccine presentation, supply availability, programmatic strength addresses the feasibility of the vaccine introduction from a technical perspective. Kenya despite being a signatory of the Abuja declaration of 2001 to commit 15% of total government expenditure to the health, only 6% is currently allocated to the health sector,. Atherly reiterates the importance of considering public health priority when introducing a new vaccine, . Despite the Ministry of health drafting very comprehensive health policies; implementation of these policies remains low, this is mainly attributed to

existing parallel systems (NGOs) and the increased number of private institutions within the health system. Knowledge and awareness that rotavirus causes most of severe diarrhea cases in children is also evidently low in Kenya; as a result, at individual level, a child who obtains rotavirus vaccine and then experiences diarrhea will be interpreted falsely as a ‘ vaccine failure’ by parents or physicians although the diarrhea episode could be due to another factor, . Developing communication strategies that put the role of rotavirus vaccine into a fit context of integrated diarrheal disease management is therefore urgently needed, . The existence of systematic safety surveillance with strict standard of quality is also very crucial, a factor that remains particularly weak in Kenya; safety surveillance is critical to determine adverse events; including intussusceptions, that might occur after introducing the vaccine in routine vaccination programs to children with different vaccine schedules, . With regards to logistics, the storage and shipment of the vaccines to prevent cold-chain breaks create a more complicated problem in comparison to those of other typical childhood vaccines; thus the need to strengthen and maintain the existing vaccine storage and logistic systems in Kenya, . Other challenges include vaccine supply and vaccine stock outs which remain a common phenomenon in Kenyan health systems, . All these issues; however should not detract from the fact that rotavirus is the most common cause of severe diarrhea in children that kills more than 1500 children a day, rotavirus vaccine should therefore form an essential part of an integrated package of strategies to improve child survival and to achieve Millennium Development Goal 4. Early rotavirus vaccine adopter countries have documented tremendous benefits following introduction of vaccination; in the USA, high vaccine coverage has

resulted in a more than 50% decrease in hospital admissions for childhood diarrhea, ; in Brazil, diarrhea-related deaths have been markedly reduced, and a similar reduction has been observed in Mexico, . Furthermore, in the USA, the effectiveness of the vaccine seems to be greater than that predicted by initial trials, suggesting herd protection not appreciated from the earlier trials, . In a recent study in south Africa, introduction of rotavirus vaccination into national immunization programme was associated with substantial reduction in severe gastroenteritis (i. e. 51% reduction) requiring hospitalization and a substantial decline in gastroenteritis associated with rotavirus infection (i. e. 67%) among children aged less than 5 years during the period 2008-2009, . A recently conducted study from Nicaragua, demonstrated that rotavirus vaccination prevented estimated 50% of the rotavirus hospitalizations at four sentinel hospitals, . Substantial reductions in deaths and hospitalizations from diarrhea have been well documented with use of rotavirus vaccines in Latin America, a contrast to the short-term, lower-level risk of intussusception . These post vaccination associated benefits support the need to promote the uptake of rotavirus vaccines into routine immunization programmes, more advocacy should therefore be done at both country and global level. For an individual child, decisions should be made by informed parents about vaccine-related benefits and risk after effective communication with health providers; from a public health perspective, however, several study analysis shows that documented health benefits of vaccination far outweigh the risks and supports continued rotavirus vaccination , . Subsidized prices of PRV vaccines by GAVI has made it affordable therefore more developing countries should be urged to introduce the vaccines into their routine immunization programme so as to

facilitate a large scale evaluation of the true effectiveness of the vaccine and to assess the impact of this important intervention in improving children's health. Continued surveillance is also critical to monitor post vaccine introduction adverse events. The high morbidity and mortality associated with rotavirus disease in Kenya underscores the need for targeted rotavirus vaccine interventions; priority should be particularly given to poorer provinces and quintiles, such as Nyanza, where the burden of rotavirus is highest. Introducing the PRV vaccine into our routine immunization programme will not only greatly influence impact but also ensure cost-effectiveness, our government should therefore act promptly to save the lives of dying Kenyan children. Currently, GAVI has ensured a reduced vaccine price for the next 5 years with an expectation that with time and expiry of patency, the vaccine prices will drop; although the current reduced prices provides an opportunity to make the vaccine available to the majority of Kenyan poor population; sustainable financial mechanism should be sought to ensure the undiscounted price is affordable for Kenya when the vaccine remains cost effective. It is apparent that Kenya faces many challenges; both policy and pragmatic issues in introducing the vaccine into the national immunization program, thus decision makers should be aware of these challenges to ensure each factor is carefully thought, planned and monitored. Continued surveillance will be critical in defining the impact on disease burden after vaccine introduction in Kenya.

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