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Journal Name:	Asian Research Journal of Mathematics
Manuscript Number:	Ms_ARJOM_107223
Title of the Manuscript:	MATHEMATICAL MODELLING OF HUMAN PAPILLOMAVIRUS DYNAMICS WITH VACCINATION INCORPORATING OPTIMAL CONTROL ANALYSIS
Type of the Article	

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PART 1: Review Comments

	Reviewer's comment	Author's comment (if agreed with reviewer, correct the manuscript and highlight that part in the manuscript. It is mandatory that authors should write his/her feedback here)
<p>Compulsory REVISION comments</p> <ol style="list-style-type: none"> Is the manuscript important for scientific community? (Please write few sentences on this manuscript) Is the title of the article suitable? (If not please suggest an alternative title) Is the abstract of the article comprehensive? Are subsections and structure of the manuscript appropriate? Do you think the manuscript is scientifically correct? Are the references sufficient and recent? If you have suggestion of additional references, please mention in the review form. <p><u>(Apart from above mentioned 6 points, reviewers are free to provide additional suggestions/comments)</u></p>	<ol style="list-style-type: none"> Since the authors do not specify any source from which the equations that model the phenomenon come (the unnumbered global equation, $N=S+V+I+C+R$ and the system of differential equations (2.1)), we assume that they are original, belong to them and this is the contribution of the importance of the article for the scientific community. A model with fewer functions is proposed, other authors use six functions for the differential system, [3] for example, compared to the five used by the authors of this paper. The model is not experimentally validated, like many other models of this type. In [10] a mathematical model of HPV dynamics is proposed, without vaccination but with treatment in the USA, also with five components of the subject population. The authors [10] also give calculation formulas for two versions of the reproductive base numbers. The results presented in the article are obtained from almost purely mathematical research on the action of a virus in a human population. There are many researches that model the dynamics of virus action through systems of differential equations. The attempt described in this article works for a description of the phenomenon with five functions (population categories into which the total population is divided), which is a factor of originality, existing, for example, in the model that uses six such categories. The interest in the obtained results can be great, but the article does not offer certain intensities of the interventions depending on the initial values of the characteristics of the epidemic. The method of obtaining intervention values is cumbersome, through simulation, and does not offer quick, accurate solutions. Moreover, the proposed calculation techniques are difficult to understand and use for the medical and administrative staff involved in the fight against viruses. Yes the title of the article is suitable. Yes, the abstract of the article is comprehensive. Yes the subsections and the structure of the article are appropriate. According to the title, the main topic of the article is the mathematical model of human papillomavirus with vaccination. The optimal analysis and other mathematical aspects are on the second plan. For this reason, the main objective of the article must be to describe the mathematical model as clearly as possible. In the definition of the model there are some problems that the authors must clarify: 1) The task of proving that there are no individuals from the considered population who simultaneously belong to at least two subsets of the partition belongs to biologists and is based on rigorous definitions of the properties of these subsets. In the paper, you must indicate the source on which you rely for these definitions so that the readers can verify the fact that the subsets of the considered partition are disjoint. For clarification, see the passage at the bottom of page 4 of the article [3] in the references, where the author, using a similar mathematical model, declares that the six components are mutually exclusive in the sense that the intersections of the six sets, two by two, are empty. In other words, the partition of the total population into six or five (as in your article) subsets is disjoint. 2) An example: in the first equation from (2.1), in the left member we have the number of individuals per time unit. Therefore, the same unit of measure must also characterize the right member, so each of the four terms of the right member. Since the parameter b is dimensionless, it follows that the product bV is measured in the number of individuals because V has the same unit of measure as S. As a result, the authors must make additional clarifications. 	

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	<p>3) In the differential system (2.1) the initial values and the initial time are not specified. The initial values of the study can be very important for the stability and optimality of the solution.</p> <p>6. Regarding the references, the Article Template requires: "References must be listed at the end of the manuscript and numbered in the order that they appear in the text. Every reference referred in the text must also be present in the reference list and vice versa. In the text, citations should be indicated by the reference number in brackets [3]." The authors must rewrite the numbering in the reference list, without the square brackets and then in the text rewrite the citations with the number between the square brackets. I did not find the citation in the text of five references: 4,5,7,8,13.</p>	
<p>Minor REVISION comments</p> <p>1. Is language/English quality of the article suitable for scholarly communications?</p>	<p>An additional control of the English language is recommended with the facilities of the text editor, but also with specialized languages (Grammarly or QuillBot, the free or licensed versions, which can also suggest more advanced forms).</p>	
<p>Optional/General comments</p>	<p>The poor quality of the modelling (lack of clarity of the hypotheses of a biological nature, the contribution of the biologists in the team of authors, in particular), several errors in mathematical drafting and many errors in the drafting of the text of the article, as well as reduced application results from conclusions and recommendations, without accurate data, quantified, therefore vague, led to the award of grade 6 with the requirement of a major revision followed by a new review. Even if the article is addressed to a mathematics journal, the research refers to the modelling of a biological phenomenon of great importance. If the authors are only mathematicians, they should have formulated the title with as subject only the treatment of a system of differential equations that models a biological phenomenon, and the hypotheses of a biological nature should all be argued from the specialized literature. The authors introduce complicated hypotheses that can only be supported with experimental biological reasoning (the disjoint partition of the population taken into account).</p>	

PART 2:

	Reviewer's comment	Author's comment (if agreed with reviewer, correct the manuscript and highlight that part in the manuscript. It is mandatory that authors should write his/her feedback here)
Are there ethical issues in this manuscript?	(If yes, Kindly please write down the ethical issues here in details)	

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