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Master Thesis Defense

Entitled

MATHEMATICAL MODELS FOR THALASSEMIA

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Abstract:

Thalassemia is a genetic blood disorder caused by gene mutation or deletion in a blood protein called hemoglobin. Treatment of thalassemia requires a life-long blood transfusion and removal of excessive iron in the blood stream, which usually causes a big pressure on health care systems. Various forms of thalassemia control measures have been used to reduce the prevalence of thalassemia major. This has resulted in a substantial reduction in the prevalence of thalassemia. However, the thalassemia carrier population remains high, which could lead to an increase in the thalassemia major population through carrier-to-carrier marriages. Thus, we developed two mathematical models at a population level to investigate the effectiveness of newborn baby and premarital screenings and two types of education such as education about thalassemia provided by primary/secondary schools and parents' concerns as control measures, and examine the impact of three marriageable actions such as normal-to-carrier, carrier-to-normal, and carrier-to-carrier marriages on thalassemia and carrier populations. Using the UAE demographic data in computer simulations we found that control measures such as newborn baby screening, premarital screening, and education about thalassemia are effective only in reducing the prevalence of thalassemia but not enough to eradicate the disease in the long term. Parents' concerns contribute to reduce the thalassemia population and the carrier-to-carrier marriage group. The promotion of carrier-to-normal marriage tends to decrease the thalassemia population and the carrier-to-carrier marriage group.

Keywords: Thalassemia, mathematical model, newborn baby screening, premarital screening, education about thalassemia, marriageable actions