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دانشکده بهداشت

پایان نامه مقطع دکتری تخصصی رشته اپیدمیولوژی

عنوان

بررسی تاثیر متغیرهای آب و هوایی بر بروز بیماریهای لیشمانیوز جلدی روستایی، اسهال خونی ، تب خونریزی دهنده کریمه کنگو ، سالمونلوز و مالاریا در ایران

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Kerman University of Medical Science

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Title:

The effect of climatic variables on the incidence of Cutaneous Leishmaniasis, Dysentery, Crimean Congo Hemorrhagic Fever, Salmonellosis and Malaria in Iran

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چکیده فارسی:

مقدمه و اهداف: تغییرات آب و هوایی احتمالا" بر بیماریهای منتقله از ناقلین و منتقله از آب و غذا تأثیر بگذارد. این مطالعه با هدف بررسی این تغییرات بر بروز بیماریهای مالاریا، لیشمانیوز جلدی روستایی، اسهال خونی ، تب خونریزی دهنده کریمه کنگو و سالمونلوز در ایران انجام شده است.

روش ها: در بررسی تاثیر تغییر اقلیم بر بیماری مالاریا، برای تعیین بهترین زمان تاخیر و ترکیب ورودی ها، از آزمون گاما استفاده شد. خروجی مدل گردش عمومی برای پیش بینی الگوی آب و هوایی آینده تحت دو سناریو(RCP ۲,۶ و RCP۸,۵) مورد استفاده قرار گرفت. ریز مقیاس نمایی آماری برای تولید مجموعه داده های هوایی سری زمانی مصنوعی با وضوح بالا با استفاده از مدل

Long Ashton Research Station Weather Generator (LARS)انجام شد. شبکه های عصبی مصنوعی برای شبیه سازی تأثیر تغییر اقلیم بر مالاریا استفاده شدند.

در بررسی تاثیر فاکتورهای آب و هوایی بر بروز بیماریهای لیشمانیوزیس جلدی روستایی، اسهال خونی و تب خونریزی دهنده کریمه کنگو، تجزیه و تحلیل با استفاده از $SARIMA^{۲}(p,d,q)(P,D,Q)_{12}$ مبتنی بر متد Box Jenkins به صورت تک متغیره و چند متغیره و$GAM^{۳}/GAMM^{۴}$ با استفاده از نرم افزار R انجام شد.

برای ارزیابی تأثیر متغیرهای هوا شناسی بر بروز هفتگی سالمونلوز از مدل خطی تعمیم یافته دوجمله ای منفی^{۵}(NBGLM) استفاده شد.

۱Representative Concentration Pathway
۲Seasonal Autoregressive Integrated Moving Average

۳Generalized Additive Model
۴Generalized Additive Mixed Model
۵Negative Binomial Generalized Linear Model

نتایج: شبیه سازی موارد مالاریا نشان داد که روند آشکاری در کاهش موارد مالاریا تا سال ۲۰۶۰ وجود دارد.

در مدل سری زمانی فصلی چند متغیره، $_{12}(0،1،1)$ $(1،0،1)$، میانگین رطوبت ماهیانه با تاخیر ۳ ماهه با بروز لیشمانیوز پوستی رابطه معکوس داشت. نتایج GAMM نشان داد که میانگین دما با تأخیر ۲ ماهه، متو سط رطوبت نسبی با تأخیر ۴ ماهه، بارش تجمعی ماهانه با تأخیر ۱ ماهه و ساعات آفتابی ماهانه با تأخیر ۱ ماهه با بروز CL ارتباط معنی دار آماری داشت .

بهترین مدل برازش شده در SARIMA چند متغیره، $_{12}(1،0،2)$ $(0،1،1)$ با تاخیر ۴ ماه بارندگی بود که به طور معنی داری با بروز اسهال خونی ارتباط داشت. در GAM ، میانگین دما با ۲ ماه تأخیر، میانگین رطوبت نسبی با ۳ ماه تأخیر، بارش تجمعی و ساعات آفتابی با یک ماه تاخیر با بروز اسهال خونی ارتباط داشت .

نتایج حاصل از multivariate SARIMA نشان داد که مدل $_{12}(0،1،1)$ $(0،1،1)$ با حداکثر دما ۵ ماه قبل، بهترین برازش را دارد. در GAM، میانگین دما ۵ ماه قبل و میانگین حداقل رطوبت نسبی ماهانه و بارندگی بدون تاخیر، با بروز تب خونریزی دهنده کریمه کنگو رابطه غیر خطی داشت.

نتایج بررسی ارتباط فاکتورهای آب و هوایی با بیماری سالمونلوز نشان داد، ۳٪ افزایش در بروز سالمونلوزیس پس از ۱٪ افزایش در حداقل رطوبت در هفته، همچنین افزایش ۴٪ در بروز به ازای ۱ درجه سانتیگراد افزایش در میانگین دما در هفته قبل رخ داد.

کلمات کلیدی: شبکه های عصبی مصنوعی؛ شبیه سازی ؛GCM[۶]؛ پیش بینی؛ سری زمانی؛ مدل تعمیم یافته جمعی؛ مدل خطی تعمیم یافته؛ دوجمله ای منفی؛ مالاریا؛؛ لیشمانیوز؛ اسهال خونی؛ تب خونریزی دهنده کریمه کنگو؛ سالمونلوز؛ کرمانشاه؛ اصفهان؛ زاهدان؛ ایران

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[۶] General Circulation Models

نتیجه گیری: نتایج مطالعه نشـــان می دهد انتقال مالاریا با متغیرهای آب و هوایی در آینده ارتباط دارد و روند انتقال کاهشی است؛ همچنین متغیرهای آب و هوایی بر بروز لیشمانیا، اسهال خونی، تب خونریزی دهنده کریمه کنگو و سالمونلوزیس تاثیر گذار است.

Abstract

Introduction: Climate change is likely to affect vector-borne and water-borne diseases. The aim of this study was to investigate these changes in the incidence of malaria, zoonotic cutaneous leishmaniasis, dysentery, Crimean Congo hemorrhagic fever and salmonellosis in Iran.

Methods: Daily data on malaria cases in Zahedan city were collected from 2000 to 2019. Gamma test was used to determine the best lags and composition of inputs. The output of the general circulation model was used to predict the future climate pattern under two scenarios (RCP 2.6 and RCP 8.5). Statistical downscaling was performed to generate a high-resolution artificial time series data set using the Long Ashton Research Station Weather Generator (LARS) model. Artificial neural networks were used to simulate the impact of climate change on malaria. Observed climate factors including maximum and minimum temperature, relative humidity, rainfall and sunshine were identified as predictors in ANN networks, and malaria cases were considered as output variables.

In order to investigate the effect of climatic variables on the incidence of dysentery, a study was performed on the data of 2017-2010 from Khorrambid district, Iran, which has a high prevalence of dysentery.

Meteorological data included mean, maximum monthly temperature, minimum monthly temperature (Celsius), average monthly rainfall (mm), mean, maximum and minimum monthly relative humidity (percentage), monthly average of sunny hours. Analysis was performed using SARIMA based on Box Jenkins method univariate and multivariate and GAM / GAMM using R software.

To evaluate the effect of meteorological variables on the weekly incidence of salmonellosis, a generalized negative binomial linear model (NBGLM) was used.

Results: Malaria transmission in Zahedan city follows a seasonal pattern. Our results show that the best delay time is 180 days. The highest cases of malaria are seen in the warmer months. Malaria case simulations showed that there is a clear trend in reducing malaria cases by 2060.

In the multivariate seasonal time series model, $(0,1,1)\ (1,0,1)_{12}$, the mean monthly humidity with a delay of 3 months was inversely related to the incidence of cutaneous leishmaniasis. GAMM results showed that mean temperature with a delay of 2 months, mean relative humidity with a delay of 4 months, cumulative monthly precipitation with a delay of 1 month and monthly sunshine hours with a delay of 1 month were statistically significantly related to the incidence of CL.

The best fit model in SARIMA was multivariate $(1,0,2)\ (0,1,1)_{12}$, with a delay of 4 months of rainfall, which was significantly associated with the occurrence of dysentery. In GAM, mean temperature with 2 months' delay, mean relative humidity with 3 months' delay, cumulative rainfall and sunny hours with one-month delay were associated with bloody diarrhea ($R^2 = 0.59$).

During the study years, 190 confirmed cases of Crimean Congo hemorrhagic fever were identified in Zahedan city. The fatality rate of this disease was 8.42%. The course of the disease followed a seasonal pattern. The results of SARIMA multivariate showed that model $(0,1,1)\ (0,1,1)_{12}$ had the best fit with a maximum temperature of 5 months ago. In GAM, the mean temperature 5 months ago and the mean minimum monthly relative humidity and uninterrupted rainfall were non-linear with the incidence of Crimean Congo hemorrhagic fever.

During the years under review, 569 confirmed cases of salmonellosis were recorded in Kermanshah province. The results showed a 3% increase in the incidence of salmonellosis after a 1% increase in minimum moisture in the previous week with an

incidence ratio (IRR) of 1.03 95% Confidence interval: 1.02-1.05, also a 4% increase in incidence, per 1 ° C increase in the average temperature in the previous week occurred, IRR: 1.04 (CI 95%: 1.02-1.06).

Conclusion: The results of this study show that malaria transmission is related to future climatic variables and has a decreasing trend. Climatic variables also affect the incidence of Leishmania, dysentery, Crimean Congo hemorrhagic fever and salmonellosis.

Keywords: Artificial neural networks; Simulation; GCM; Forecast; Time series; Generalized collective model; Generalized linear model; Negative binomial; Malaria; Leishmaniasis; Dysentery; Crimean Congo hemorrhagic fever; Salmonellosis; Kermanshah; Esfahan; Zahedan; Khorambid; Iran

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بسمه تعالی

تاریخ .....

شماره.....

پیوست.....

صورتجلسه دفاع از پایان نامه

دانشگاه علوم پزشکی کرمان

مدیریت تحصیلات تکمیلی دانشگاه

جلسه دفاعیه پایان نامه تحصیلی خانم سیران نیلی دانشجوی دکتری تخصصی (Ph.D) رشته اپیدمیولوژی دانشکده بهداشت دانشگاه علوم پزشک
کرمان تحت عنوان " بررسی تاثیر متغیرهای آب و هوایی بر بروز بیماری های لیشمانیوز جلدی روستایی، دیسانتری، تب خونریزی دهنده کریمه ک
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مهر و امضاء معاون آموزشی

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