高病原性Cryptococcus gattiiの感染防衛に寄与する樹状細胞ワクチン、口頭	上野圭吾, 金城雄樹, 大久保陽一郎, 浦井 誠, 金子幸弘, 大野秀明, 亀井克彦, 澁谷和俊, 宮﨑義継	第63回日本感染症学会東日本地方会学術集会	2014年10月	国内
真菌の薬剤耐性の現状と課題、口頭	名木 稔, 田辺公一, 石野敬子, 梅山 隆, 山越 智, 大野秀明, 宮﨑義継	第63回日本感染症学会東日本地方会学術集会	2014年10月	国内
肺アスペルギローマとの鑑別が困難であったPseudallescheria boydiiによる肺菌球症の1 例、口頭	本川奈々, 福田雄一, 今村圭文, 宮崎泰可, 泉川公一, 大野秀明, 柳原克紀, 宮﨑義継, 早田 宏, 田代隆良, 河野 茂	第62回日本化学療法学会西日本支部総会・第57回日本感染症学会中日本地方会学術集会・第84回日本感染症学会西日本地方会学術集会	2014年10月	国内

黒色菌糸症の１例、口頭	多田明子, 山本剛伸, 藤本亘, 河口 豊, 浦井 誠, 梅山 隆, 宮崎義継	第263回日本皮膚科学会岡山地方会	2014年9月	国内
高病原性クリプトコックス症に対する樹状細胞ワクチンの効果、口頭	上野 圭吾, 大久保陽一郎, 清水公徳, 金子幸弘, 浦井 誠, 水口裕紀, 奈良拓也, 川本 進, 大野秀明, 澁谷和俊, 宮崎義継, 金城雄樹	第25回日本生体防御学会学術総会	2014年7月	国内
カンジダ属の抗真菌薬耐性、口頭	田辺公一, 大野秀明, 名木 稔, 浦井 誠, 金子幸弘, 梅山 隆, 山越 智, 宮崎義継	第35回関東医真菌懇話会	2014年6月	国内

ミカファンギン耐性Candida glabrata株のin vitro性状解析、口頭	田辺公一, 大野秀明, 名木 稔, 浦井 誠, 金子幸弘, 梅山 隆, 山越 智, 荒木光二, 皿谷 健, 宮崎義継	第35回関東医真菌懇話会	2014年6月	国内
腹膜透析中に発症したCryptococcus laurentiiによる腹膜炎の一例、口頭	浦井 誠, 金子幸弘, , 稲垣浩司, 狩谷哲芳, 政本大二郎, 水谷 真, 名木 稔, 上野圭吾, 山越 智, 田辺公一, 梅山 隆, 大川原明子, 金城雄樹, 大野秀明, 宮崎義継	第35回関東医真菌懇話会	2014年6月	国内
マウスモデルでの肺炎球菌蛋白・糖脂質併用ワクチンの感染防御効果の解析、口頭	金城雄樹, 金子幸弘, 梅山 隆, 川上和義, 大石和徳, 宮崎義継	第88回日本感染症学会学術講演会・第62回日本化学療法学会総会合同学会	2014年6月	国内

症例から学ぶ感染症セミナー―ムーコル症の真菌同定検査、口頭	梅山　隆, 大野秀明, 田辺公一, 山越　智, 名木稔, 宮﨑義継	第88回日本感染症学会学術講演会・第62回日本化学療法学会総会合同学会	2014年6月	国内
病原糸状菌Aspergillus fumigatusのPolo-likeキナーゼ遺伝子破壊株の菌糸成長・分生子形成・抗真菌薬感受性への影響、ポスター	梅山　隆, 山越　智, 田辺公一, 名木稔, 金子幸弘, 金城雄樹, 大野秀明, 宮﨑義継	第88回日本感染症学会学術講演会・第62回日本化学療法学会総会合同学会	2014年6月	国内
カンジダ属の抗真菌薬感受性の変貌、口頭	田辺公一, 大野秀明, 名木 稔, 浦井 誠, 金子幸弘, 梅山 隆, 山越 智, 知花博治, 亀井克彦, 宮﨑義継	第88回日本感染症学会学術講演会・第62回日本化学療法学会総会合同学会	2014年6月	国内

高病原性Cryptococcus gattii由来莢膜多糖の免疫細胞に及ぼす影響、口頭	浦井 誠, 金子幸弘, 田辺公一, 梅山 隆, 山越 智, 金城雄樹, 大野秀明, 杉田 隆, 宮﨑義継	第88回日本感染症学会学術講演会・第62回日本化学療法学会総会合同学会	2014年6月	国内
真菌感染症について：薬剤耐性真菌、口頭	宮﨑義継	第3回日本微生物学連盟市民公開フォーラム	2014年4月	国内
教育講演４　Clostridium difficile感染症について.	加藤はる	第８８回日本感染症学会学術講演会　福岡	2014年6月	国内
国際シンポジウムAll about Clostridium difficile infection in the world「What is going on about Clostridium difficile infection in Japan?」	Kato H.	第45回日本嫌気性菌感染症学会 東京	2015年2月	国内
Pneumococcal antibody levels in Japan before the introduction of pneumococcal conjugate vaccine.	Hamaguchi S, Akeda Y, Tomono K, OishiK.	International Symposium on Pneumococcal and Pneumococcal Diseases. p.80. Hyderabad, India. March 9-13, 2014	March 9-13, 2014	国外

2．学会誌・雑誌等における論文掲載

掲載した論文（発表題目）	発表者氏名	発表した場所 （学会誌・雑誌等名）	発表した時期	国内・外の別
Development and introduction of inactivated poliovirus vaccines derived from Sabin strains in Japan.	Shimizu H.	Vaccine	(in press)	国外
Establishment of a panel of in-house polyclonal antibodies for the diagnosis of enterovirus infections.	Kotani O, Iwata-Yoshikawa N, Suzuki T, Sato Y, Nakajima N, Koike S, et al.	Neuropathology	(in press)	国外
Surveillance of hand, foot, and mouth disease for a vaccine.	Shimizu H, Nakashima K.	Lancet Infect Dis 14(4), 262-3,	2014	国外
Development of an efficient entire-capsid-coding-region amplification method for direct detection of poliovirus from stool extracts.	Arita M, Kilpatrick DR, Nakamura T, Burns CC, Bukbuk D, Oderinde SB, Oberste MS, Kew OM, Pallansch MA, Shimizu H.	J Clin Microbiol 53: 73-78,	2015	国外

Genetic diversity of circulating Saffold viruses in Pakistan and Afghanistan.	Naeem A, Hosomi T, Nishimura Y, Alam MM, Oka T, Zaidi SS, Shimizu H.	J Gen Virol 95: 1945-1957,	2014	国外
sIPV Evaluation Group of NIID Virology II. A national reference for inactivated polio vaccine derived from Sabin strains in Japan.	Shirato H, Someya Y, Ochiai M, Horiuchi Y, Takahashi M, Takeda N, Wakabayashi K, Ouchi Y, Ota Y, Tano Y, Abe S, Yamazaki S, Wakita T,	Vaccine 32: 5163-5169,	2014	国外
ライノウイルスの分類と疾患への関与.	清水博之	日本医事新報　4689: 53-55,	2014	国内
急増した手足口病	清水博之	感染・炎症・免疫 44, 94-96,	2014	国内
東アジア地域を中心とした手足口病流行の現状.	清水博之	感染症43, 50-51, 54-59,	2014	国内

「消化器ウイルス篇　エンテロウイルス-ポリオウイルスおよび非ポリオエンテロウイルス」の項を担当、臨床医のための呼吸器・消化管ウイルス感染症	清水博之	診断と治療社（堤裕幸、中野貴司、寺田喜平、編）、103-109.	2014	国内
Common isolation of New Delhi metallo-β-lactamase 1-producing Enterobacteriaceae in a large surgical hospital in Vietnam.	Hoang TH, Ehsani S, Shibayama K, Matsui M, Suzuki S, Minh BN, Duong NT, Phuong VT, Linh DT, Thu HN, Anh DD, Son HT, Hien NT, Wertheim H.	Eur J Clin Microbiol Infect Dis	(in press)	国外
外来型カルバペネマーゼ産生腸内細菌科細菌の検出状況	鈴木里和、松井真理、鈴木仁人、柴山恵吾	病原微生物検出情報（IASR）35(12):287-288	2014	国内
Direct detection of Mycobacterium avium in environmental water and scale samples by loop-mediated isothermal amplification.	Nishiuchi Y, Tamaru A, Suzuki Y, Kitada S, Maekura R, Tateishi Y, Niki M, Ogura H, Matsumoto S.	J Water Health. 12:211-9.	2014	国外

Global population structure and evolution of Bordetella pertussis and their relationship with vaccination.	Bart MJ, Harris SR, Advani A, Arakawa Y, Bottero D, Bouchez V, Cassiday PK, Chiang CS, Dalby T, Fry NK, Gaillard ME, van Gent M, Guiso N, Hallander HO, Harvill ET, He Q, van der Heide HG, Heuvelman K, Hozbor DF, Kamachi K, Karataev GI, Lan R, Lutyńska A, Maharjan RP, Mertsola J, Miyamura T, Octavia S, Preston A, Quail MA, Sintchenko V, Stefanelli P, Tondella ML, Tsang RS, Xu Y, Yao SM, Zhang S, Parkhill J, Mooi FR.	mBio 5:e01074	2014	国外
Comparison of loop-mediated isothermal amplification and real-time PCR for detecting Bordetella pertussis.	Allahyar Torkaman MR, Kamachi K, Nikbin VS, Lotfi MN, Shahcheraghi F.	J Med Microbiol.	[Epub ahead of print]	国外
微生物ABC 百日咳	蒲地一成	up-to-date 子どもの感染症. 2(2):18-21	2014	国内

Epidemiology and Molecular Characteristics of Norovirus GII.4 Sydney 2012Gastroenteritis Outbreaks in Taiwan, January 2012–December 2013.	Fang-TzyWu, MS, Hsieh-Cheng Chen, MS, Catherine Yen, MD MPH, Ching-Yi Wu, MS, Kazuhiko Katayama, Ph D, Jason C. Huang, PhD, Ho-Sheng Wu PhD.	Arch Virol	(in press)	国外
Association between Giardia duodenalis and co-infection with other diarrhea-causing pathogens in India.	Mukherjee, A. K., Chowdhury, P., Bhattacharya, M. K., Rajendran, K., Nozaki, T., and Ganguly. S.	BioMed Res Int, Volume 2014, Article ID 786480,	2014	国外
Interaction between Nbp35 and Cfd1 proteins of cytosolic Fe-S cluster assembly reveals a stable complex formation in Entamoeba histolytica.	Anwar, S., Dikhit, M. R., Singh, K. P., Kar, R. K., Zaidi, A., Sahoo, G. C., Roy, A. K., Nozaki, T., Das, P., and Ali, V.	PLoS One 9, e108971 doi: 10.1371/journal.pone.0108971.	2014	国外
Multiple-locus variable-number tandem repeat analysis and clinical characterization of Leptospira interrogans canine isolates.	Koizumi N, Mizutani Muto M, Izumiya H, Suzuki M, Ohnishi M.	J Med Microbiol.	(in press)	国外

レプトスピラ症	小泉信夫, 大西真	月刊公衆衛生情報. 44: 22-23,	2014	国内
レプトスピラ症	小泉信夫, 大西真	感染症内科. 2: 159- 164	2014	国内
Ongoing increase in measles cases following importations, Japan, March 2014: times of challenge and opportunity.	Takahashi T, Arima Y, Kinoshita H, Kanou K, Saitoh T, Sunagawa T, Ito H, Kanayama A, Tabuchi A, Nakashima K, Yahata Y, Yamagishi T, Sugawara T, Ohkusa Y, Matsui T, Arai S, Satoh H, Tanaka-Taya K, Komase K, Takeda M, Oishi K	Western Pac Surveill Rresponse J 16; 5(2) 31-3	2014	国外
Development of an improved RT-LAMP assay for detection of currently circulating rubella viruses.	Abo H, Okamoto K, Anraku M, Otsuki N, Sakata M, Icenogle J, Zheng Q, Kurata T, Kase T, Komase K, Takeda M, Mori Y.	Journal of Virological Methods. 207, 73-77.	2014	国外

The host protease TMPRSS2 plays a major role in in vivo replication of emerging H7N9 and seasonal influenza viruses.	Sakai K, Ami Y, Tahara M, Kubota T, Anraku M, Abe M, Nakajima N, Sekizuka T, Shirato K, Suzaki Y, Ainai A, Nakatsu Y, Kanou K, Nakamura K, Suzuki T, Komase K, Nobusawa E, Maenaka K, Kuroda M, Hasegawa H, Kawaoka Y, Tashiro M, Takeda M.	J Virol. 88: 5608-5616.	2014	国外
海外の麻疹の情報 2013	駒瀬勝啓 竹田誠	病原微生物検出情報 35（4）；97-98	2014	国内

潜在的な疫学リンクが疑われたD8型ウイルスによる麻疹広域散発事例	山岸拓也、伊東宏明　八幡裕一郎　中島一敏松井珠乃　高橋琢理　木下一美砂川富正　奥野英雄　多屋馨子大石和徳　駒瀬勝啓　三崎貴子丸山絢　大嶋孝弘　清水英明岩瀬耕一　岡部信彦　小泉祐子平岡麻理子　瀬戸成子　杉本徳子　荷見奈緒美熊谷行広　大塚吾郎　杉下由行甲賀健史　鈴木理恵子　阿南弥生子　舟久保麻理子　弘光明子坂本洋　阿部勇治　氏家無限	病原微生物検出情報 35（4）；100 - 102	2014	国内
フィリピン渡航者～のD9型麻しんルイスの検出-福岡市	古川英臣 梶山桂子 宮代　守 佐藤正雄 伊藤孝子 酒井由美子 井出瑤子 植山　誠 眞野理恵子 衣笠有紀 戸川　温 高田　徹 猪狩洋介 駒瀬勝啓	病原微生物検出情報 35（5）；132	2014	国内
輸入麻疹と国内伝播	竹田誠 駒瀬勝啓	感染症 44(6) 206-217	2014	国内

Phylogeographic analysis of rabies viruses in the Philippines.	Kentaro Tohma, Mariko Saito, Taro Kamigaki, Laarni T. Tuason, Catalino S. Demetria, Jun Ryan C. Orbina, Daria L. Manalo, Mary E. Miranda, Akira Noguchi, Satoshi Inoue, Akira Suzuki, Beatriz P. Quiambao, Hitoshi Oshitani	Infection, Genetics and Evolution, 23:8694.	2014	国外
Association between RABV G Proteins Transported from the Perinuclear Space to Cell Surface Membrane and Nglycosylation of the Sequon at Asn204.	Hamamoto, N., Uda A., Tobiume, M., Park, C.-H., Noguchi, A., Kaku, Y., Okutani, A., Morikawa, S., Inoue, S.	JJID	(in press)	国内
Reverse transcription polymerase chain reaction-based method for selectively detecting vegetative cells of toxigenic Clostridium difficile.	Senoh M, Kato H, Murase T, Hagiya H, Tagashira Y, Fukuda T, Iwaki M, Yamamoto A, Shibayama K.	Microbiol Immunol 58: 615-620.	2014	国外

Fulminant pseudomembranous colitis caused by Clostridium difficile PCR ribotype 027 in a healthy young woman in Japan.	Nishimura S, Kou T, Kato H, Watanabe M, Uno S, Senoh M, Fukuda T, Hata A, Yazumi S.	J Infect Chemother 20: 729-731.	2014	国外
Identification of SIV Nef CD8+ T cell epitopes restricted by a MHC class I haplotype associated with lower viral loads in a macaque AIDS model.	Nomura T, Yamamoto H, Takahashi N, Naruse TK, Kimura A, Matano T.	Biochem Biophys Res Commun 450: 942-947	2014	国外
the Japanese IPD Study Group. Hyporesponsiveness to the infecting serotype after vaccination of children with seven-valent pneumococcal conjugate vaccine following invasive pneumococcal disease.	Tamura K, Matsubara K, Ishiwada N, Nishi J, Ohnishi H, Suga S, Ihara T, Bin Chang B, Akeda Y, Oishi K,	Vaccine. 32:1444-1450	2014	国外
Global control of pneumococcal infections by pneumococcal vaccines.	Oishi K, Tamura K, Akeda Y.	Trop Med Health. 42 (2) Suppl 83-86	2014	国外

Breakthrough invasive Candida glabrata in patients on micafungin: a novel FKS gene conversion correlated with sequential elevation of MIC.	Saraya T, Tanabe K, Araki K, Yonetani S, Makino H, Watanabe T, Tsujimoto N, Takata S, Kurai D, Ishii H, Miyazaki Y, Takizawa H, Goto H.	Journal of Clinical Microbiology. 52(7):2709-2712	2014年	国外
Potent drugs that attenuate anti-Candida albicans activity of fluconazole and their possible mechanisms of action.	Urai M, Kaneko Y, Niki M, Inoue M, Tanabe K, Umeyama T, Fukazawa H, Ohno H, Miyazaki Y.	Journal of Infection and Chemotherapy. 20(10):612-615	2014年	国内
A case of Fusarium paronychia successfully treated with occlusive dressing of antifungal cream.	Ikeda I, Ohno T, Ohno H, Miyazaki Y, Nishimoto K, Fukushima S, Makino T, Ihn H.	Journal of Dermatology. 41(4):340-2	2014年	国内
特集 感染症動向2015 播種性クリプトコックス症	宮﨑義継	メディカル朝日. 1: 16-17	2015年	国内

V. 感染症検査・真菌	宮﨑義継, 金子幸弘, 樽本憲人	パーフェクトガイド検査値事典[第2版]. 477-481	2014年	国内
侵襲性カンジダ症の診断～血清診断～遺伝子診断	梅山 隆, 宮﨑義継	侵襲性カンジダ症. 115-117	2014年	国内
III 診断・治療法から見た大切な真菌症、4 治療薬の選択と投与	金子幸弘, 浦井 誠, 宮﨑義継	目で見る真菌と真菌症. p192-202	2014年	国内
真菌症-よく目にする真菌症から今後注意すべき真菌症まで-Aspergillus: 病態と抗原価の関連	梅山 隆, 大野秀明, 宮﨑義継	感染症内科. 2(6):575-580	2014年	国内
日本にも現れたクリプトコックス・ガッティ	大野秀明, 宮﨑義継	日経サイエンス. 44(5):76	2014年	国内

座談会：深在性真菌症の診断・治療ガイドラインを読み解く	河野 茂, 亀井克彦, 二木芳人, 宮﨑義継	呼吸. 33(5):435-43	2014年	国内
ミニ特集：病原体サーベイランス体制とその利用、国立感染症研究所の立場から	宮﨑義継, 砂川富正, 大石和徳	小児科. 55(4):403-6	2014年	国内
耐性病原体up-to-date～耐性メカニズムから治療戦略まで～、I 抗微生物薬に対する耐性メカニズム、2 抗真菌薬耐性	田辺公一, 宮﨑義継	化学療法の領域. 30(S-1):20-5	2014年	国内

Hindawi Publishing Corporation
BioMed Research International
Volume 2014, Article ID 786480, 7 pages
http://dx.doi.org/10.1155/2014/786480

Hindawi

Research Article

Association between *Giardia duodenalis* and Coinfection with Other Diarrhea-Causing Pathogens in India

Avik K. Mukherjee,[1] Punam Chowdhury,[1] Krishnan Rajendran,[2] Tomoyoshi Nozaki,[3] and Sandipan Ganguly[1]

[1] *Division of Parasitology, National Institute of Cholera and Enteric Diseases, P-33 CIT Road, Scheme XM, Beliaghata, Kolkata, West Bengal 700010, India*
[2] *Division of Data Management, National Institute of Cholera and Enteric Diseases, P-33 CIT Road, Scheme XM, Beliaghata, Kolkata, West Bengal 700010, India*
[3] *Department of Parasitology, National Institute of Infectious Diseases, 1-23-1 Toyama, Shinjuku-ku, Tokyo 162-8640, Japan*

Correspondence should be addressed to Sandipan Ganguly; sandipanganguly@gmail.com

Received 16 December 2013; Revised 17 May 2014; Accepted 20 May 2014; Published 9 June 2014

Academic Editor: Moreno Bondi

Giardia duodenalis, is often seen as an opportunistic pathogen and one of the major food and waterborne parasites. Some insights of *Giardia* infestation in a diarrhoea-prone population were investigated in the present study. Our primary goal was to understand the interaction of this parasite with other pathogens during infection and to determine some important factors regulating the diarrhoeal disease spectrum of a population. *Giardia* showed a steady rate of occurrence throughout the entire study period with a nonsignificant association with rainfall ($P > 0.05$). Interestingly coinfecting pathogens like *Vibrio cholerae* and rotavirus played a significant ($P \leq 0.001$) role in the occurrence of this parasite. Moreover, the age distribution of the diarrhoeal cases was very much dependent on the coinfection rate of *Giardia* infection. As per our findings, *Giardia* infection rate seems to play a vital role in regulation of the whole diarrhoeal disease spectrum in this endemic region.

1. Introduction

Giardia duodenalis is present worldwide but is more prevalent in developing countries where the lack of sanitation and hygiene awareness is a matter of concern [1, 2]. Considering its high endemicity in some countries, research on *Giardia* is of low priority as the infection it causes is self-limiting, a situation that enhances its propagation. Giardiasis is caused by the protozoan parasite *Giardia duodenalis* [3] which is usually transmitted through ingesting contaminated food and water. A wide variety of pathogens can cause diarrhea, but *G. duodenalis* impacts the economic growth of a country by affecting the Disability Adjusted Life Year (DALY) rates [4]. Giardiasis has much lower mortality rates associated with it than do other diarrheagenic pathogens such as *Vibrio cholerae* or *Shigella* [5]; nevertheless, it may still play an important role in regulating the spectrum of diarrheal diseases in diarrhea-prone regions. The study described herein was designed to survey the prevalence of *G. duodenalis* among diarrheal patients within Kolkata, India. Kolkata is a densely populated city with a variable socioeconomic and climatic background and is frequently affected by outbreaks of diarrheal disease; hence that is why the area was chosen for disease transmission studies [6].

Fecal samples were tested from patients attending the Infectious Diseases and Beliaghata General (IDBG) Hospital in Kolkata city throughout a period of 56 months. These patients only complained of diarrhea. A systemic sampling procedure [7] allowed us to collect enough data to demarcate the catchment areas for diarrhea within the city and to interpret the epidemiological aspects of *Giardia* infestation in an urban region of this developing country.

2. Methods

2.1. Ethics Statement. This study received ethical clearance from the National Institute of Cholera and Enteric Diseases (NICED) ethical committee, the host institute.

2.2. Study Design. The study was performed through collaboration between NICED and IDBG Hospital, Kolkata. IDBG is located within the city of Kolkata and is the largest infectious diseases hospital in India. IDBG treats around 25000 cases of diarrhea every year and most of these patients are residents of the city [6]. Thus, the prevalence of diarrheal diseases in the city can be estimated by surveying IDBG patients. Every fifth patient visiting IDBG who complained of only diarrheal symptoms on two randomly selected days per week was enrolled in the study. The study ran from November 2007 to June 2012. A single fecal sample was sent to the laboratory for analysis by trained healthcare professionals who also obtained the patient's background history via a systematically designed questionnaire. Patient consent for the study was obtained at the same time. The system remained unbiased with regard to sex, age, or other physical factors with nearly proportional distribution of male and female subjects and age ranging from 0 to 60 years in the majority of cases.

2.3. Screening for G. duodenalis in Stool Samples. *G. duodenalis* was detected in stool samples by using three different procedures. Stool samples were divided into three aliquots immediately after reaching the laboratory. The first aliquot was used for microscopic analysis with iodine wet-mount and trichrome staining [8] after concentration using "Ridley's concentration technique" [9]. The second aliquot was used in an antigen capture enzyme-linked immunoabsorbent assay using a GIARDIAII kit (TechLAB, Blacksburg, VA, USA) as per the manufacturer's protocol. DNA was extracted directly from the third aliquot of each stool sample using a DNA Stool Minikit (Qiagen, USA), according to the manufacturer's protocol. PCR was performed using *G. duodenalis*-specific primers and the DNA extracted by the kit as template following previously published protocols [7, 10]. All of the *G. duodenalis*-positive cases were also investigated for coinfections with other common pathogens as described previously [7]. The bacterial and viral coinfection status of a sample was investigated with assistance from Drs. T. Ramamurthy, T. Krishnan, and M. C. Sarkar in their laboratories at NICED [6].

2.4. Statistics and GIS Mapping. Data were entered into the predesigned format of the *pro forma* in the SQL server that has an inbuilt entry validation checking facilitated program by trained data entry professionals. Data were randomly checked and matched for consistency and validity. Edited data were exported and analyzed using SPSS.19.0 and Epi-info 3.5.4 [11].

The inferential age group was explored for *G. duodenalis*-positive cases by multinomial logistic regression [12, 13]. The aim of this was to determine the age groups that were most likely to be infected with *G. duodenalis*. Five age groups were classified, that is, up to 5 years, >5–10 years, >10–20 years, >20–30 years, 30–40 years, and >40 years, and were coded as 1–6, respectively. The relationships between the risk-dependent variable and each of the categorical explanatory variables are shown in Table 1. Infections caused by *G. duodenalis* were classified "1" when the pathogen was present or "2" when absent. The extreme values of the classified age group were fixed as a reference category.

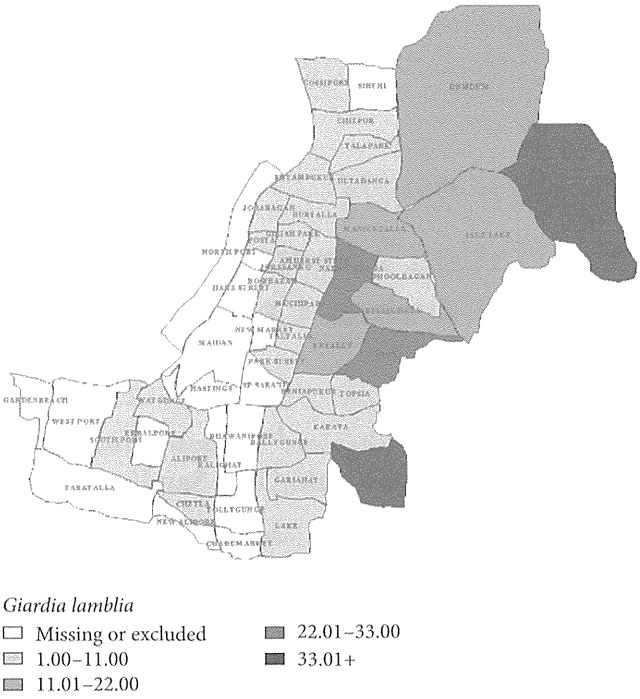

FIGURE 1: *Giardia duodenalis* distribution area. Map of the study region showing the catchment areas for the *Giardia duodenalis* cases according to our surveillance report (November 2007 to June 2008).

Associations between *G. duodenalis* infection and other variables such as rainfall or coinfection with other pathogens were tested using EpiInfo 3.5.4. Where the presence of *G. duodenalis* was considered an outcome variable, factors like rainfall, overall coinfection, and major coinfection were assigned as dependent variables. Where the P value was ≤ 0.05, this was considered a valid association [14].

A choropleth map was constructed to display the data from the area where all the positive samples had originated within the city [15]. For this map, the different colors and patterns were combined to depict the different values of the attribute variable associated with each area. Each area is colored according to the category into which its corresponding attribute value had fallen. *G. duodenalis*-positive cases were embedded on the thematic map by the geographical information system (GIS) to visualize the infections. The boundary map shows that the prevalence of *G. duodenalis* was highest in Rajarhat and Tiljala (31.0%), followed by Narkeldanga and Tangra (22–33%), while the values for Dum Dum, Salt Lake, Beliaghata, Maniktala, and Entally regions ranged from 11 to 22 percent (Figure 1).

3. Results and Discussion

Single stool samples from 4039 diarrheal patients were examined throughout a 56-month period, and 413 (i.e., 10.2%) of them tested positive for *G. duodenalis*. All the data were categorized on a monthly basis to assess any