Spectrum of CNS Infections in the Philippines

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ABSTRACT

The CNS Infection Censuses for 2011 and 2012 from 9 neurology training programs in 7 institutions in the Philippines were collated to determine the types of CNS infections seen in the country and their relative frequencies. A comparison with a similar survey done in 1999 was made. A total of 1629 cases of CNS infections were recorded. There were 23 categories. Bacterial meningitis (34.3%) and TB meningitis (30.7%) were the top two infections, constituting more than half of all CNS infections seen. When the adult and pediatric census were separated, TB meningitis came up to be the most common infection in adults (43%) with bacterial meningitis a poor second at 19.4%. The reverse is seen in the pediatric population – bacterial meningitis (41.7%) vs. TB meningitis (24.6%). Cryptococcal meningitis was more frequent in the adult census (8.1%) compared with the pediatric census (0.1%). These patterns were seen in a similar census done in 1999. A significant increase in relative frequency in cryptococcal cases was seen in the later census (2.8% vs. 2.0%), the increase being due to the marked increase in the adult group (8.1% vs. 4.3%), probably due to the upward trend in the incidence of HIV cases in the country. No increase in this category was seen in the pediatric population. The benefits of collaboration among institutions in coming up with a large number of cases of CNS infections and a greater variety to study was highlighted. The study was conducted by the CNS Infection Council of the Philippine Neurological Association.

Keywords: CNS infections, census, neurology training programs, Philippines

BACKGROUND

While cerebrovascular disease tops all causes of neurologic admissions in the Philippines, CNS infections continue to be one of the major reasons for admissions to the hospital in the country. In a teaching hospital with an active neurology service and training program (UERM Hospital), CNS infections constituted 2.25% of all admissions to the Neurology Service in 2011 and 2012.2 Of 42 cases admitted in said hospital, TB meningitis ranked number 1 (18/42) or 42%, followed by bacterial meningitis (8/42) or 19%, viral encephalitis (8/42, 19%), cryptococcal meningitis (7/42, 17%), and brain abscess (1/42, 2.3%). These data were derived from a purely adult neurology service.[1]

In 1999, the CNS Infection Council of the Philippine Neurological Association conducted a survey to determine the spectrum of CNS infections seen by neurologists practicing in the country by simply combining the one (1) year census of CNS infections from eight (8) neurology training programs located in six (6) institutions.2 Of the 8 training programs, 5 were adult neurology and 3 were pediatric neurology programs (Table 1). While all of the above training programs are located in one geographical area (Metro Manila) and may not accurately reflect the type of cases seen in the whole country, the Council decided to limit data coming from neurology training institutions for the accuracy of the diagnosis for each CNS infection.

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Table 1.Neurology Training Programs Participating in the 1999 Survey

Adult	Pediatric
University of the East Ramon Magsaysay Memorial Hospital (UERM) University of Santo Tomas (UST) St. Luke's Medical Center Makati Medical Center Philippine General Hospital (PGH)	Philippine Children's Medical Center (PCMC) University of Santo Tomas (UST) Philippine General Hospital (PGH)

A total of 892 cases and 19 categories of neuroinfections were noted and summarized in Table 2.

From these data, it can be seen that the top two (2) CNS infections are bacterial meningitis (30%) and TB meningitis (29%), constituting more than 50% of all CNS infections.

METHODS

THE PRESENT STUDY (2011-12)

In 2013, the CNS Infection Council of the Philippine Neurological Association decided to repeat the census done in 1999 to determine possible changing trends over a 12-year period. The same methodology of combining census from neurology training institutions regarding their CNS infection cases but this time covering two years instead of one. Ten (10) neurology training programs (7 adult and 3 pediatric) located in eight (8) institutions contributed data. All programs are from one geographical area (Metro Manila) as in 1999. (Table 3)[3]

RESULTS

A total of 1629 cases (average of 814/year) of CNS infections were recorded from 2011-12. Five hundred forty two (542) or 33% were from the adult census while one thousand eighty seven (1087) or 67% were from the pediatric population. Twenty three (23) categories of CNS infections were identified (Table 4 and Appendix A) present

Table 3. Neurology Training Programs in the Philippines which Contributed Data to the Present Census, 2011-12

Training Program	Number of Cases
Philippine General Hospital (PGH, pedia)	783
Philippine Children's Medical Center (PCMC, pedia)	254
Philippine General Hospital (PGH, adult)	178
Jose Reyes Memorial Medical Center (JRMMC, adult)	167
Makati Medical Center (MMC, adult)	64
Santo Tomas University Hospital (STUH, pedia)	50
University of the East Ramon Magsaysay Memorial Hospital (UERMMH, adult)	42
St. Luke's Medical Center(SLMC, adult)	36
Santo Tomas University Hospital (STUH, adult):	31
The Medical City (TMC, adult)	24

Table 2. CNS Infection Census in Selected Training Institutions (1999)

	Training Insitutions									
CATEGORY	UERM	PCMC	UST Adult	UST Pedia	St. Luke's	Makati Med	PGH Adult	PGH Pedia	TOTAL	PERCENT
Bacterial Meningitis	3	106	13	2	8	19	19	97	267	29.9%
TB Meningitis	18	18	53	10	10	7	54	88	258	28.9%
Meningitis (Unspecified)	2		67	34		6			109	12.2%
Viral encephalitis	1	18	9		4	24	7	31	94	10.5%
Brain abscess	2	4	10	2	3	3	9	39	72	8.1%
Cryptococcal meningitis	5	1	7			1	4		18	2.0%
Tuberculoma	1							13	14	1.6%
TB Abscess			7	3					10	1.1%
Shunt Infection								9	9	1.0%
Viral Meningitis	2		2					4	8	0.9%
Ventriculitis								6	6	0.7%
Cavernous Sinus Thrombophlebitis								6	6	0.7%
Tetanus			3			2		1	6	0.7%
Subdural empyema								4	4	0.4%
Neurosyphilis			3						3	0.3%
Cerebral malaria			2		1				3	0.3%
Intraspinal abscess			2						2	0.2%
Epidural abscess		1							1	0.1%
Neurocysteceroc sis					1				1	0.1%
Cerebral schistosomiasis							1		1	0.1%
TOTAL	**34**	**148**	**178**	**51**	**27**	**62**	**94**	**298**	**892**	**100%**

Compiled by the CNS Infection Council of the Philippines Neurological Association

survey in contrast to the 1999 census where 3 cases were reported.

The top two (2) CNS infections are bacterial meningitis (34.3%) and TB meningitis (30.3%), again constituting more than 50% of all CNS infections and similar to the findings in 1999. Overall, cryptococcal meningitis constituted 2.8%.

The data gathered was then analyzed separately for the adult and the pediatric population which was easy to determine because the training programs surveyed were either adult or pediatric neurology programs. The adult neurology programs were UERM, UP-PGH (adult), UST (adult), Makati Med, St. Luke's, Medical City and Jose Reyes Memorial Medical Center (JRMMMC). The pediatric neurology programs were UP-PGH (pedia), UST (pedia), and Philippine Children's Medical Center (PCMC).

In the adult population, the number one CNS infection is clearly TB meningitis, accounting for 43% of all cases of CNS infections. Bacterial meningitis was second at 19.4%. (Table 5).

In the pediatric age group, there is a reversal of ranking of the top two infections. The top CNS infection is bacterial meningitis at 41.7% while TB meningitis cases accounted

Table 4. 2011-12 Census: n=1629

CNS Infection Category	Number of Cases
Bact. Meningitis	558 (34.3%)
TB Meningitis	500 (30.7%)
Brain abscess	159 (9.8%)
Viral encephalitis	125 (7.7%)
Encephalitis (unspecified)	58 (3.6%)
Others	57 (3.5%)
Crypto meningitis	45 (2.8%)
Meningitis (unspecified)	21 (1.3%)
TORCH infections	16 (1.0%)
Ventriculitis	15 (0.9%)
Subdural empyema	15 (0.9%)
Tuberculoma	14 (0.9%)
Viral Meningitis	12 (0.7%)
Cavernous sinus thrombophlebitis	10 (0.6%)
Shunt infection	5 (0.3%)
Cerebral schistosomiasis	4 (0.2.%)
Neurocysticercosis	3 (0.2%)
Toxoplasmosis	3 (0.2%)
Cerebral malaria	2 (0.1%)
TB abscess	1 (0.1%)
Intraspinal abscess	1 (0.1%)
NeuroSY	0 (in 1999, 0.3%)

Table 5. Adult Census of CNS Infections, 2011-12:
Total: 542 cases

CNS Infection Category	Number of Cases
TB Meningitis	233 (43%)
Bacterial Meningitis	105 (19.4%)
Viral encephalitis	56 (10.3%)
Brain abscess	50 (9.2%)
Cryptococcal Meningitis	44 (8.1%)
Viral Meningitis	11 (2.0%)
Cavernous Sinus Thrombophlebitis	10 (1.8%)
Meningitis (unspecified)	7 (1.3%)
Tuberculoma	7 (1.3%)
Tetanus	4 (0.7%)
Cerebral Schistosomiasis	3 (0.6%)
Neurocysticercosis	3 (0.6%)
Toxoplasmosis	3 (0.6%)
Subdural Empyema	2 (0.4%)
Cerebral Malaria	2 (0.4%)
TB abscess	1 (0.2%)

for only 24.6% of cases, but still ranking second (Table 6 and Appendix A).

Table 7 shows a comparison of selected infections between the adult and pediatric groups.

Table 6. Census from Pediatric Neurology Programs: n=1087

CNS Infection Category	Number of Cases
Bacterial Meningitis	453 (41.7%)
TB Meningitis	267 (24.6%)
Brain Abscess	109 (10%)
Viral encephalitis	69 (6.3%)
Encephalitis (unspecified)	58 (5.3%)
TORCH *	16 (1.5%)
Ventriculitis	15 (1.4%)
Meningitis (unspecified)	14 (1.3%)
Subdural empyema	13 (1.2%)
Tuberculoma	7 (0.6%)
Shunt infection	5 (0.5%)
Cryptococcal Meningitis	1 (0.1%)
Viral Meningitis	1 (0.1%)
Cerebral schistosomiasis	1 (0.1%)
Intraspinal abscess	1 (0.1%)

**TORCH – toxoplasmosis, other agents, rubella, cytomegalovirus, herpes simplex*

Here one sees a reversal of ranking between the TB and bacterial meningitis. Regarding cryptococcal meningitis, one notes that it constituted 2.8% of all CNS infections in all age groups (Table 4). When one looks at this disease in the adult and pediatric group, cryptococcal meningitis constituted 8.1% of all neuroinfections in the adult population (Table 5) while it only accounted for 0.1% of all CNS infections in the pediatric population (Table 6). Clearly, cryptococcosis of the brain is essentially an adult disease.

Table 7. Comparison of Selected CNS infections between Adult and Pediatric

Adult (n=542)	*Pediatrics (n=1087)*
Tuberculous Meningitis – 43%	Tuberculous meningitis – 24.6%
Bacterial meningitis – 19.4%	Bacterial meningitis = 41.7%
Cryptococcal meningitis – 8.1%	Cryptococcal meningitis – 0.1%
Viral – 10.3%	Viral – 11.6%
Brain abscess = 9.2%	Brain abscess – 10%

A comparison of selected categories between the 1999 census and the 2011-12 census is presented in Table 8 and 9.

Overall, there is an increase in the relative frequency of cryptococcal cases from 1999 to 2012 by 40%.

Table 8. Comparison of 1999 vs 2011-2012 Census

	1999	2011-2012
No. of cases	892	814
No. of training programs	8	10

Table 9. Comparison of 1999 vs 2011-2012 Census

Category	1999	2011-2012
Bacterial meningitis	29.9%	34.2%
TB meningitis	28.9%	30.7%
Meningitis (unspecified)	12.2%	1.3%
Viral encephalitis	10.5%	7.7%
Encephalitis (unspecified)	0	3.6%
Brain abscess	8.1%	9.8%
Cryptococcal meningitis	2.0%	2.8%

Analyzing the data in this category in the adult and pediatric populations separately, one notes that the increase in the relative frequency of cryptococcal meningitis from 1999 to 2012 (Table 10) was entirely due to the doubling of the relative frequency in the

Table 10. Cryptococcal CNS Infections: Adult

1999	*2011-2012*
4.3%	8.1%

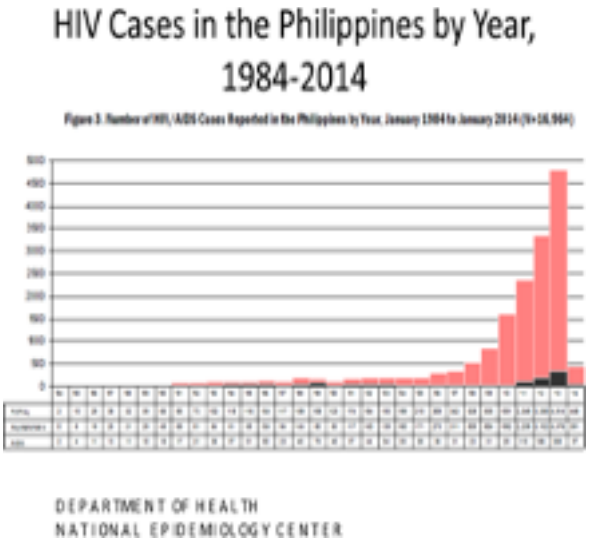
adult population from 4.3% in 1999 to 8.1% in 2011-12.

In the pediatric population, the relative frequency of cryptococcal meningitis even declined from 0.2% to 0.1%.

Table 11. Cryptococcal CNS Infections: Pedia

1999	*2011-2012*
0.2%	0.1%

While the data collected did not show the predisposing factors for cryptococcal meningitis (as this was not specifically sought for), it is a known fact that the incidence of HIV cases in the Philippines continued to rise from 1984 to 2013 (Figure 1).[4]



This increase in the relative frequency of cryptococcal meningitis changed the TB meningitis : Cryptococcal meningitis ratio from 8:1 in 1999 to 5:1 in the 2011-12. Since the clinical and CSF picture of TB and cryptococcal meningitis is similar, the differential diagnosis for TB meningitis in the Philippines is always cryptococcal meningitis, and vice-versa. So, in 1999, for every 9 cases of chronic lymphocytic meningitis, one would turn out to be cryptococcal. But in 2012, one can expect to see one cryptococcal case for just every 6 cases of chronic meningitis. The need to be more aware of fungal meningitis, therefore, has increased.

There are diseases that were seen only in the adult population – cavernous sinus thrombophlebitis, tetanus, neurocysticercosis and cerebral malaria. There are also disease categories reported only in the pediatric population – TORCH and shunt infections.

SIGNIFICANCE OF THE STUDY

Why do a census?

This small study, however simple as it is, highlighted the following:

First, it defined the spectrum of CNS infections seen in the Philippines. Although it may not accurately reflect the true picture for the entire country, as the data was gathered only from Metro Manila, it gives a relatively good picture of what to expect in the rest of the archipelago.

Second, a census allows physicians and researchers to track down changes through the years.

Thirdly, such a census identifies priority areas for research, education and public health intervention. It is clear that TB and bacterial meningitis remain the top two CNS infections in the Philippines.

Fourthly, it may provide parameters for evaluation of treatment and prevention strategies. By collecting data on results of treatment, one may see trends in improvement in survival as management strategies and diagnostic capabilities are improved.

Fifth, it establishes an effective network for cooperative studies. It also significantly increases sample size for any research endeavor.

FUTURE DIRECTIONS

It is the intention of the CNS Infection Council of the Philippine

Neurological Association to continue the census in the coming years, while expanding the data collected. In future censuses, the following tasks are envisioned:

1. Expand the survey within each hospital so cases that are seen exclusively by other services (such as internal medicine, infectious diseases, general pediatrics, neurosurgery) can be included.
2. Expand the survey to the national level to obtain a picture that is more reflective of the entire country.
3. Gather more data per category of disease, such as:
    a. Case fatality rate
    b. For bacterial meningitis: specific etiologic organisms and their antibiogram
    c. For TB meningitis: isolation rate of the TB bacilli
    d. For cryptococcal meningitis: identify predisposing conditions, if any
    e. For viral infections: specific virus agent, if identified and rate of identification of specific agent.
4. Generate research questions on specific diseases.

It would also be interesting to find out the spectrum of CNS infections in other countries and how it compares to that of the Philippines. By making these data available to the rest of the world, we hope to stimulate collaboration in research with the goal of decreasing, if not altogether eliminating, these infectious diseases of the nervous system.

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Appendix A

Table 2. CNS Infection Census in Neurology Training Institutions in the Philippines (2011-12)

Category	UERM	PCMC	UST Adult	UST Pedia	St. Luke's	Makati Med	PGH Adult	PGH Pedia	TMC	JRMMC	TOTA L	PERCEN T
Bacterial Meningitis	8	88	8	30	7	19	16	335	7	40	558	34.3.%
TB Meningitis	18	29	11	7	10	9	104	231	4	77	500	30.7%
Brain Abscess	1	14		3		1	19	92	1	28	159	9.8%
Viral Encephalitis	8	59	8	10	8	15	13		4		125	7.7%
Encephalitis (unspecified)								58			58	3.6%
Others								57				3.5%
Cryptococcal meningitis	7	1	1		4	10	19		3		45	2.8%
Meningitis (unspecified)		14	3						4		21	1.3%
TORCH		6						10			16	1.0%
Ventriculitis		15										0.9%
Subdural Empyema		13				1	1				15	0.9%
Tuberculoma		7				2				5	14	0.9%
Viral Meningitis		1				3	3			5	12	0.7%
Cavernous Sinus Thrombophlebitis										10	10	0.6%
Shunt Infection		5									5	0.3%
Tetanus						3			1		4	0.2%
Cerebral schisto		1					3				4	0.2%
Neurocysticercosis					1					2	3	0.2%
Toxoplasmosis					1		2				3	0.2%
Cerebral malaria					1	1					2	0.1%
TB Abscess					1						1	0.1%
Intraspinal Abscess		1									1	0.1%
CJD							1				1	0.1%
NeuroSY											0	0.0%
Epidural Abscess												
TOTAL	**42**	**254**	**31**	**50**	**36**	**64**	**178**	**783**	**24**	**167**	**1629**	**100%**